FACTORY

MANAG[illegible] AND MAINTENANCE

WHAT THE STEEL DISPUTE MEANS TO YOU

A last-minute analysis by DAVID L. COLE

Member, President Truman's Steel Fact-Finding Panel

SPECIAL 4-PAGE INSERT PRECEDING PAGE 65

OCTOBER 1949

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A typical example of B. F. Goodrich product improvement

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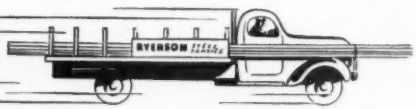

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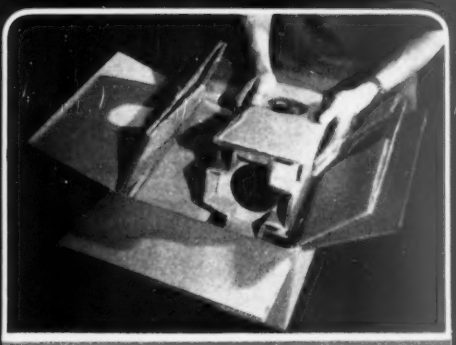

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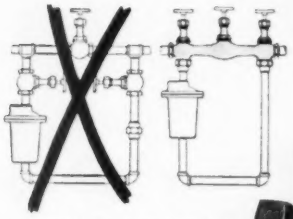
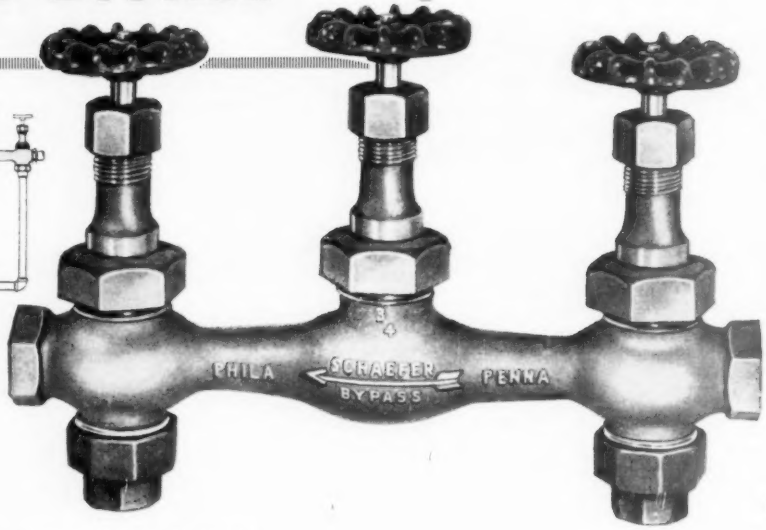


Outmoded set-up at left uses 18 threaded joints . . . Belfield Bypass uses only eight.



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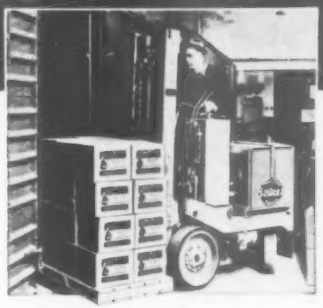
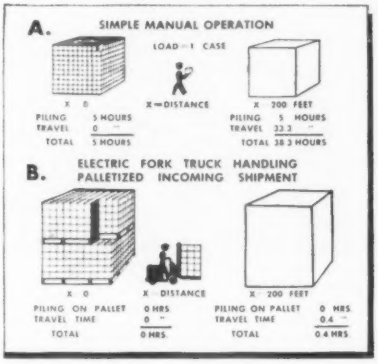
HOW A BAKER TRUCK CAN CUT A $38.33 Handling Cost to 59¢



Most material handling problems consist principally of two fundamental operations—(1) Transportation, and (2) Piling. The following simple example shows how a handling operation, costing $38.33 by hand methods, can be cut to 59.6¢ by the use of BAKER Fork Trucks and pallets.

THE PROBLEM—To move a pile of 1000 cases a distance of 200 feet and re-pile.

This problem is obviously oversimplified. In practice these operations are repeated many times and with many variations—but the ratio of savings remains essentially the same.



COST BY HAND METHODS

1. **Transporting** – Practical Load – 1 case. Estimated walking speed 200 ft. per minute. Time – 1000 round trips, 2000 minutes or 33.33 hours. Labor cost at $1.00 per hour $33.33
2. **Piling** – Estimated rate – 200 cases per hour. Total time – 1000 cases – 5 hours. Labor cost at $1.00 per hour 5.00

TOTAL COST – HAND METHODS **$38.33**

COST WITH *BAKER* FORK TRUCK AND PALLETS

1. **Labor Cost** – Pallet load – 50 cases. Time per round trip with truck 1.2 minutes (includes picking up pallet load, travel, tiering, and turning around.) Total time – 20 round trips, 24 minutes or .4 hours. Labor Cost (Operator at $1.00 per hour) ..... .40
2. **Truck Cost** – Annual cost – owning and operating Fork Truck and Pallets $980.00. Per hr. cost (2000 hrs. per year) 49¢. Cost for .4 hours ..... .196

TOTAL COST – WITH TRUCK ..... **.596**

TOTAL SAVINGS – $37.73, or 98.5%.

How the cost of Baker Fork Truck-Pallet operation compares with still other handling methods is shown in the charts 1 and 2 at left.

"A" and "F" represent methods discussed above.

"B" and "C" show costs of hand trucking, B with 2-wheel truck—5 cases per load; C with 4-wheel truck—20 cases per load.

"D" represents the conveyor method, where the only labor costs are for piling.

"E" represents costs for Baker Fork Truck operation where cases are not originally palletized.

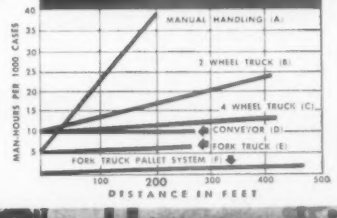
In Chart 2, the starting point of each line indicates man-hours required for piling, and the path of the line shows man-hours for increasing distances. Obviously, the greater the distance, the greater the savings with BAKER Trucks.

Let a Baker Material Handling engineer show you how similar savings can be made in your plant.

CHART 1

CASE	LABOR COST	TRUCK COST	TOTAL COST PER 1000 PIECES
A (MANUAL)	$38.30		$38.30
B (2 WHEEL HAND TRUCK)	$16.60		$16.60
C (4 WHEEL HAND TRUCK)	$11.60		$11.60
D (CONVEYOR)	$10.00		$10.00
E (FORK TRUCK)	$5.40	.196	$5.59
F (PALLET-FORK TRUCK SYSTEM)	.40	.196	.59

CHART 2



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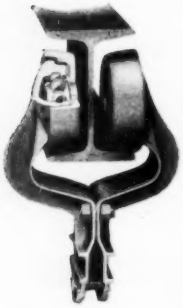

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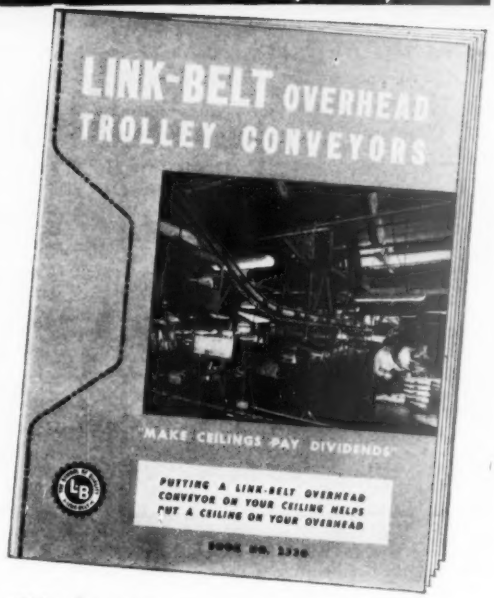
Link-Belt makes practically all types of conveyors (see below) as well as a complete line of power transmission machinery. We suggest you discuss your problem with a Link-Belt engineer, who will offer practical advice. Get in touch with the Link-Belt office nearest you.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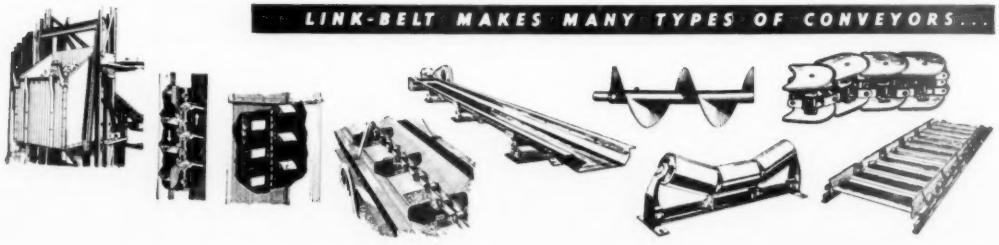

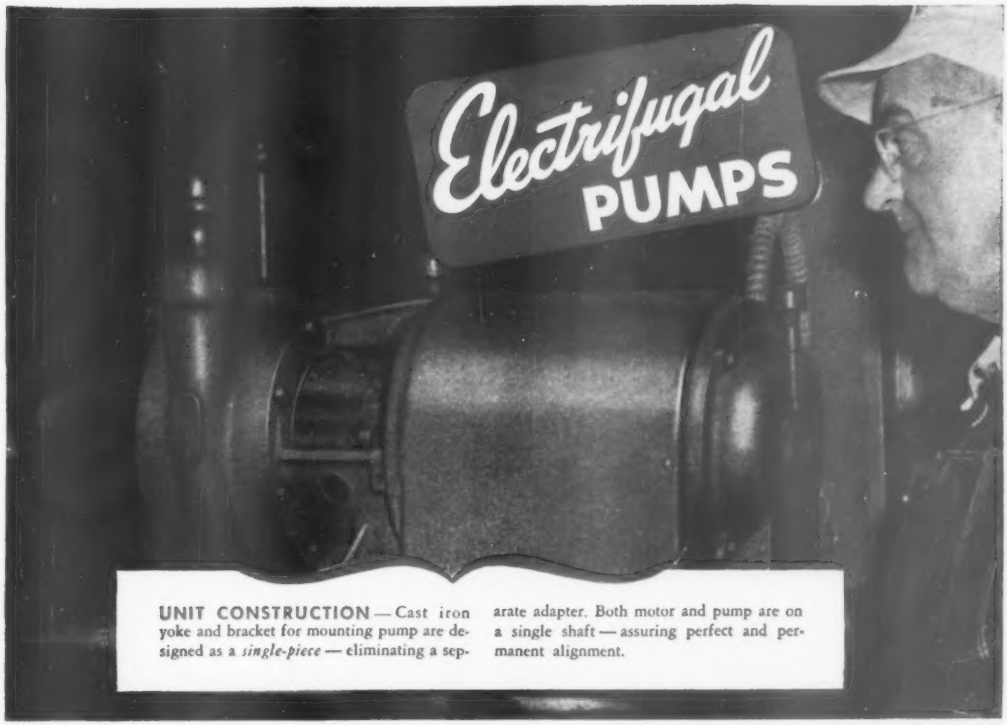

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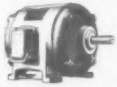

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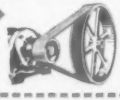

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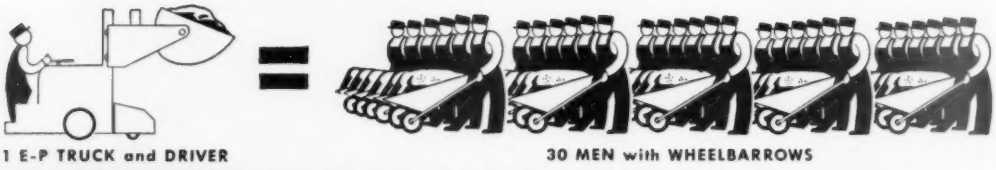

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This Elwell-Parker Truck with Rotary Scoop was placed on a job of moving bulk salt a distance of 100 feet from a stockpile in the processor's plant to freight cars.

Careful time studies divulged that the Elwell-Parker was able to move the material *7½ times faster than a four man gang!* This huge saving enabled the truck to pay for itself in less than a year.

Elwell-Parkers have developed *major economies* in over 300 branches of industry during the past 43 years. To profit by this unexcelled materials handling experience, ask us to send the EP man. The Elwell-Parker Electric Company, 4323 St. Clair Avenue, Cleveland 3, Ohio.

ELWELL-PARKER

Established 1893

POWER-INDUSTRIAL TRUCKS

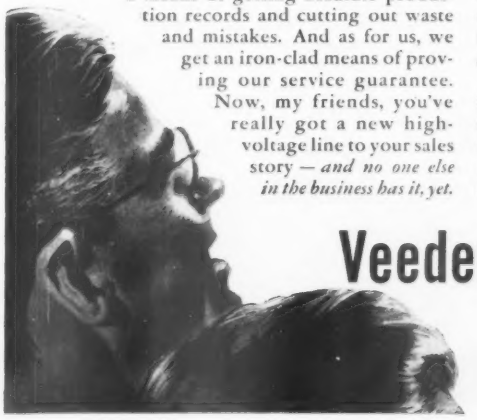
Brother Peddlers! . . .
Meet our New Star Salesman
*. . . this built-in VEEDER-ROOT COUNTER**

LISTEN TO THIS SALES MANAGER: "First of the month, this counter goes into all our machines as standard, original equipment. This means *our customers get a new service* from our product—a means of getting accurate production records and cutting out waste and mistakes. And as for us, we get an iron-clad means of proving our service guarantee. Now, my friends, you've really got a new high-voltage line to your sales story—*and no one else in the business has it, yet.* Let's get going!"

That's an example of how "countless" products began to click faster in sales . . . *when they began to count.* For built-in Veeder-Root *Count*rol is a valuable extra service, a distinctive feature that talks business in the language of the toughest customer . . . *in plain, black-and-white figures.*

And these figures can be put to work in endless ways, for a poultry-physician or a map-maker, as the case may be. So why not for *you?* Don't say: "But my product can't count." Give it a chance to speak for itself . . . directly to *us.* Write.

*The Counter shown is a V-R Medium-Size Counter . . . about 4½" long, built into a long list of products to count strokes, turns, pieces, or what have you. It's one of scores of V-R counters shown in the 8-page condensed catalog. *Write for your copy.*



Veeder-Root COUNTERS

VEEDER-ROOT INC., HARTFORD 2, CONNECTICUT

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3. *In Great Britain:* Veeder-Root Ltd., Kilspindie Road, Dundee, Scotland.

Grooming a "Cat" Motor Grader with OSBORN POWER BRUSHES

THE Caterpillar Tractor Co., Peoria, Illinois, is world famous for its earth-moving and road-building equipment.

And typical of the company's high standards of manufacture, many exterior metal parts of "Caterpillar" Machines are thoroughly cleaned of extraneous, rust-forming matter with Osborn Power Driven Brushes.

Shown in the photos above are two examples of the effective method employed in the removal of weld and heat scale from circle drawbar assembly and steel frames of "Caterpillar" Motor Graders.

In upper left, an Osborn Disc-Center* Wire Cup Brush, mounted on a portable air tool, cuts away heat scale from a "Caterpillar" drawbar and provides a really clean finish for painting.

In upper right, an Osborn Disc-Center* Wire Wheel Brush quickly removes weld scale from a heavy "Cat" Motor Grader frame and leaves the metal surface in perfect condition for subsequent painting.

This is just one of hundreds of "case histories" where longer lasting Osborn Power Driven Brushes are cutting production costs in finishing operations.

If you have an industrial finishing problem, why not let an informed Osborn sales engineer provide you with cost-cutting facts on Osborn Brushes—without obligation.

*Trademark

See Osborn's complete line of industrial brushes at the National Metal Exposition, Cleveland, Ohio, October 17-21, Booth No. 817.

THE OSBORN MANUFACTURING COMPANY

Dept. 191, 5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

48 **pages packed with practical down-to-earth data showing actual examples of cost-saving production techniques.**

45 ***case studies...***

...crammed with facts showing HOW photoelectric and electronic controls solve problems and prevent bottlenecks in industry. Indexed both by industries (textile, paper, metal, etc.) and by application (counting, detecting, sorting, etc.), its factual data tears aside the hocus-pocus and makes electronic control an easy-to-understand aid to industry.

Acting with the speed and certainty of light, Photoswitch photoelectric and electronic controls count, guard, sort, record, detect, measure, weigh, maintain liquid levels, program operating cycles and do countless other tasks with unfailing accuracy and amazing speed.

No industry which has ever been surveyed has failed to show one or more applications which bring benefits to plant operation.

Clip the coupon or write us on your own letterhead for YOUR copy of the free booklet shown above.

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INCORPORATED
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PHOTOSWITCH, INCORPORATED
79 Broadway, Cambridge 42, Mass.

Please send my free copy of:
"Cutting Production Costs with Electronic Controls"

Name.....*Title*.....

Company.....

Street.....

City.....*Zone*.....*State*.....

Do your motors operate under conditions of overload, heat, moisture? Are oil, dust, acids or corrosive vapors and fumes hazardous to motor operation in your plant? Interested in reducing motor failures—down time—rewind expense?

Then insist on Fiberglas*-base Electrical Insulating Materials on your next motor rewind. You'll find they have far higher resistance to these hazards than organic insulations . . . that they will save you time and money.

In or near your community, there are rewind experts skilled in the use of these highly efficient electrical insulating materials. Their shops are identified as Approved Fiberglas Repair and Rewind Shops . . . the motors they rewind are identified by the label shown above. Thousands of users all over the country are getting more dependable performance from motors bearing this sign—the sign of *performance plus*. Check the classified section in your phone book or write us for names of the shops in or near your community where you can obtain this service. Owens-Corning Fiberglas Corporation, Dept. 861, 16 East 56th Street, New York 22, N. Y.

OWENS-CORNING
FIBERGLAS
ELECTRICAL
INSULATING
MATERIALS

*FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

Did you ever get a letter like this from your boss?

NICE GOING, JOE!
American Business
Everytown, U.S.A.
September 15, 1949
Dear Joe:
The way you put before me facts and figures on how we could cut our handling costs practically in half with Automatic Electric Trucks, certainly got rid of one of our biggest "cost-itis" headaches.
You have won the suggestion box award of the month, and from now on you're a regular member of our Management Committee.
Congratulations, and keep up the good work.

The pay-off for Joe...he showed the Boss how to cut handling costs in half!

Sure, with prices under pressure, sales declining, profits being squeezed, the boss is apt to say: "*Lay low on capital expenditures.*"

But if you take him at his word, especially when it comes to handling costs, you're not doing him, the business or yourself any good.

Whatever your manual handling costs are now, deduct 50%, and you'll have the cost of handling your products with Automatic Electric Trucks. Imagine what relief *that* would give your boss from his "Cost-itis" headaches.

So get yourself all the facts about these amazing electric trucks and lay them before him. With effortless, easy finger-tip control, they *lift, move* and *stack* hundreds of pounds, or tons and tons of your material so easily, a stenographer could operate them in a breeze.

Yes, these mighty giants of electric power do all the work. One man accomplishes as much as three men doing fatiguing *manual* handling. The other two can be moved to more productive, better paying jobs.

Send the coupon today . . . and when you get all the figures, you can show your boss the thousands and thousands of dollars these electric trucks are saving industry every day, and how *similar savings may be his!*

You'll be rewarded for your interest . . . and you'll be the man he will keep his eye on for the better jobs that are always coming up. Mail the coupon now, and see how fast things start looking up for you!

Trade **Automatic** Mark
ELECTRIC TRUCKS
Lighten LIFE'S LOADS

TRADE **Automatic** MARK

39 W. 87th St., Dept. T-9, Chicago 20, Ill.

Please send me complete money-saving facts on amazing Automatic Electric Trucks, without obligation.

Company Name.....
By.....Position.....
Street Address.....
City.....Zone.....State.....

Westinghouse

Fluorescent Lamps

NOW LAST 3 TIMES AS LONG!

...YET COST NO MORE!

SAVE 2/3

SAVE THIS– ONE LAMP NOW LASTS AS LONG AS 3.

LAMP COSTS

TIME SPENT REPLACING BURNED-OUT LAMPS

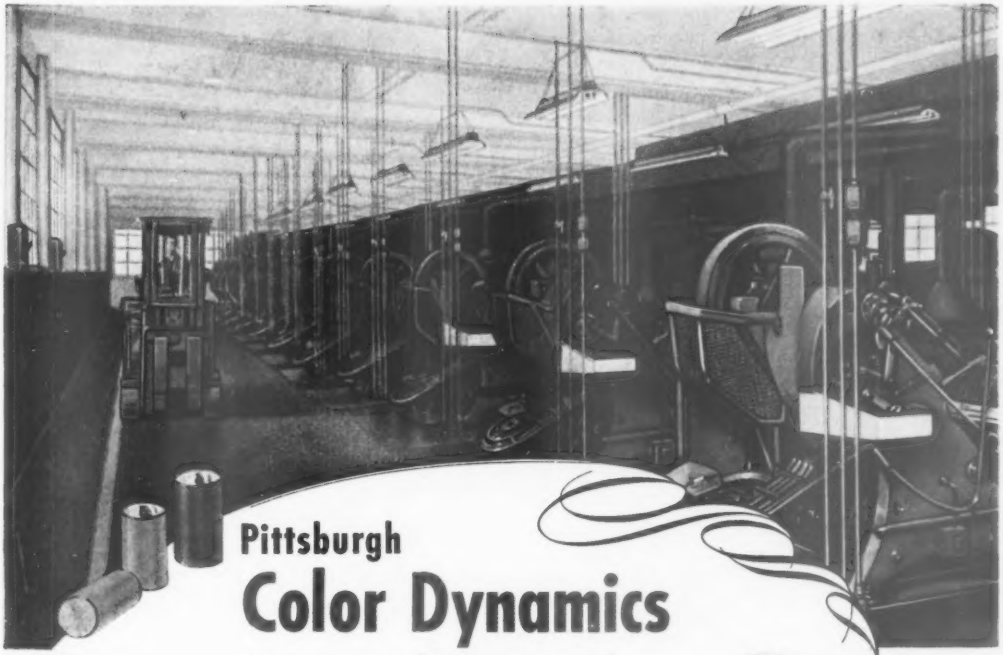
SAVE THIS– LAMPS NEED BE REPLACED ONLY ⅓ AS OFTEN.

Here's the biggest news in fluorescent lamps that's come along in years . . . NOW Westinghouse fluorescent lamps will last 2½ years in average store installations . . . 3 years in average one-shift office or factory installations.

Light output, too, has been improved—Westinghouse fluorescent lamps now burn brighter and longer than ever before. So, when you buy lamps, buy Westinghouse and save! Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

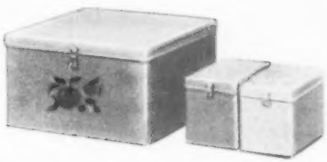
YOU CAN BE SURE... IF IT'S

Westinghouse



Pittsburgh Color Dynamics

increases efficiency and improves morale of employees in Continental Can Company plant



Open top press room of Continental Can Company's Baltimore plant after being repainted according to COLOR DYNAMICS specifications.

PITTSBURGH can present no more convincing claim for the benefits resulting from the use of COLOR DYNAMICS—based upon the scientific principles of the *energy in color*—than these comments of John G. Murray, Eastern Division Manager of Operations of the Continental Can Company, of New York City. This company is one of the world's largest producers of metal containers for foods, beverages, and kitchenware of many types.

"We repainted our Baltimore plant, according to the principles of COLOR DYNAMICS," writes Mr. Murray. "After nearly a year's experience we find the new color scheme has reduced eye strain and physical fatigue among our employees. It has also created a more pleasing atmosphere. A better spirit among the workers has prevailed since this repainting has been done."

In hundreds of other industries production executives are similarly learning that color properly "engineered" on machines, walls, floors and ceilings actually improves efficiency and simplifies housekeeping.

We'll be glad to make a COLOR DYNAMICS survey of your plant on request without obligation to you.

Paint RIGHT with Color Dynamics
Paint BEST with Pittsburgh Paint!

The benefits of COLOR DYNAMICS are made more enduring when you use Pittsburgh's long-lasting high-quality paints for every need.

WALLHIDE—available in four types: **FLAT**—a velvet-like finish that is beautiful and restful; **SEMI-GLOSS**—with higher sheen; **GLOSS**—with enamel-like sheen; **PBX**—extra-durable finish can be washed frequently.

LAVAX PBX ENAMEL—for woodwork, furniture or metal trim. Brushes out freely and easily to a smooth, satin finish.

FLORHIDE—for floor surfaces. Quick-drying, tough, can be scrubbed with soap solutions.

LAVAX MACHINERY ENAMEL—a durable finish impervious to grease, grime or dirt.

SEND FOR A COPY OF THIS BOOK!

Pittsburgh Plate Glass Co., Paint Div., Department PM-109, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your new revised and enlarged Booklet, "*Color Dynamics in Industry*."

☐ Please have your representative call for a Color Dynamics Survey of our properties without obligation on our part.

Name_____

Street_____

City_____ County_____ State_____

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

They TIME and FIRE

the resistance-welding shot

Plant output may depend on the replacement availability of these tubes. Your local G-E tube distributor stocks them. Phone him for fast service!

LET a welding-machine stop, and production slows. If the welder isn't running again within a reasonable time, some feeder to your main assembly line may close down, idling men and machinery.

Electronic tubes control the resistance-welding process . . . lightning-fast thyratrons for timing, husky steel-jacket ignitrons to send current surging through the electrodes. These tubes are long-serving, but now and then one must be replaced. Without its full complement of tubes, a welder won't operate.

Availability then becomes a "must." And the best way, the fastest way, to get new welding tubes for emergency replacement, is to phone your nearby General Electric tube distributor. He has thyratrons and ignitrons in stock . . . *now*. They will be delivered to your door . . . *immediately*.

Your G-E distributor carries the right types to meet your welder-socket needs—a wide range, of which the three tubes shown here are typical. Take advantage of his fine facilities, his experience, his pledged desire to serve you! *Electronics Department, General Electric Company, Schenectady 5, New York.*

You can put your confidence in—

GENERAL ELECTRIC

180-HA12

NEW ALTITUDE RECORDS in assembly and sales...

...both are "jet-assisted" by AMERICAN PHILLIPS SCREWS

NEW ALTITUDE MARKS IN ASSEMBLY: Savings zoom skyward when American Phillips Screws take over the cost-controls in any assembly operation. *Time-savings alone climb as high as 50%* . . . over old-fashioned, slowpoke, fumble-and-fume slotted screws! Meanwhile spoilage and rejects . . . yes, and lost-time accidents, too . . . are grounded once and for all.

NEW ALTITUDE MARKS IN SALES: Next time you board a commercial airliner . . . or *any* plane, for that matter . . . look around you and see what the aviation industry thinks of American Phillips Screws. *They use almost nothing else but!* And aside from the assembly savings and the vibration-proof fastenings, there's another customer-consideration in there, also . . because there's never a burr on a Phillips head to snag clothes or scratch hands. Buyers of everything from airplanes to zithers, what's more, are coming to recognize *and look for* the American Phillips crossed recess as a sure surface index of inbuilt quality in *any* product. Does *yours* have this sales advantage? Just write:

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. Norristown, Pa. *Detroit 2:* 502 Stephenson Bldg.

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

AMPLE POWER + FINGER-TIP CONTROL

= MOBILIFT!

Mobilift has models ranging in capacity from 2000 pounds to 3500 pounds. Yet with ample power to handle such loads, Mobilift is designed for easy finger-tip control. Its tilt, its lift, and its patented disc clutch are all controlled by easy-working levers located together at convenient finger-tip level. Mobilift has no gears to shift, making it the most maneuverable of all lift trucks. These facts add up to ample load-carrying ability plus unusual speed of operation—more trips per hour, more tons of materials moved per day.

Mail the coupon below—let us show you how Mobilift combines ample power and easier control for more economy and efficiency in materials handling.

MOBILIFT CORPORATION FM-1
835 S.E. Main St., Portland 14, Oregon

Please send me your illustrated folder on Mobilift operation.

Name_____

Firm_____

Address_____

City_____ State_____

MOBILIFT
"The MIGHTY MIDGET"

District Sales Offices

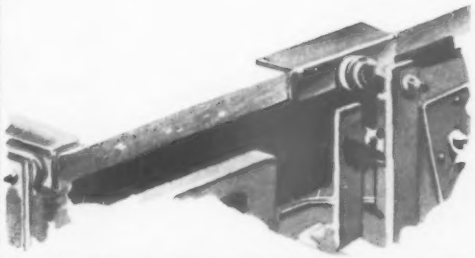
NEW YORK BERKELEY ATLANTA
CHICAGO LOS ANGELES DALLAS

Good Steps to Take...

to make a plant a better plant...

The On-The-Floor Test

From the standpoint of safety, what makes the best floor surface for a plant? There have been a lot of guesses but now they *know*. A pair of "dawgs" pounding the "pavements" of an electronic stepmeter is used to measure the safety efficiency of any walkway surface. It's a sure test to find the best.



The On-The-Wall Test

From the standpoint of results and economy, what is the best paint for a plant? Again, there have been a lot of guesses . . . but there's one *sure* way to tell. Test paints *on the wall.*

Yes, compare a gallon of any good paint with a gallon of Barreled Sunlight. Thin each according to directions on the can. Paint them on a wall, side by side, and see the results. Measure the difference in yardage. Check how solidly each covers . . . and the appearance of both after drying. And *by all means,* keep close tabs on the amount of painting time required for each paint, because time means labor which represents 80% of painting costs.

It's a simple test to make. But brother, how it proves that Barreled Sunlight gives you a better looking, longer lasting paint job *for less money* than any other paint on the market.

Talk it over with the Barreled Sunlight representative. Write and he'll call.

U. S. GUTTA PERCHA PAINT COMPANY
2-J Dudley Street, Providence, Rhode Island

Barreled Sunlight *Paints*

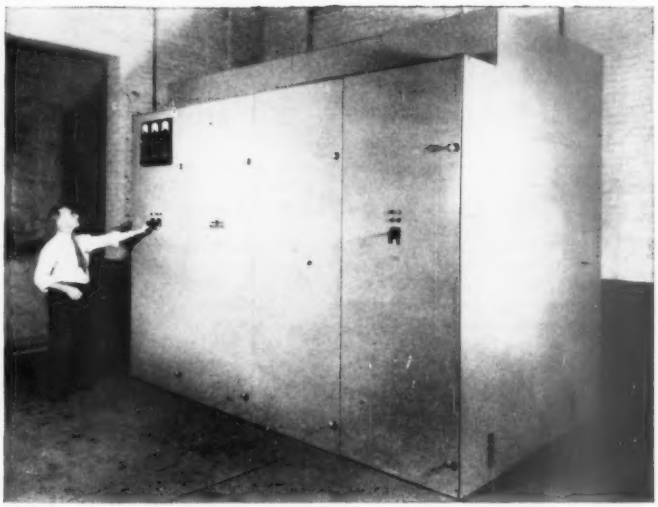
In whitest white or clean, clear, pleasing colors, there's a Barreled Sunlight Paint for every job

It always costs more not to paint!

The Balmar Corporation
ENGINEERS MACHINISTS
BALTIMORE, MARYLAND

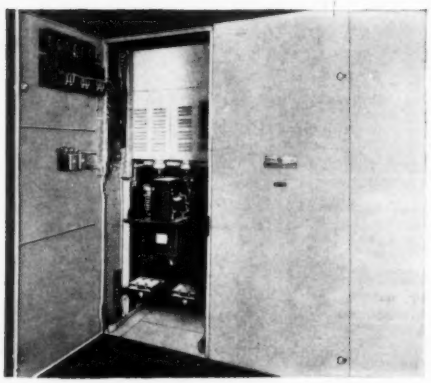
Manufacturers of Railroad Equipment

chooses



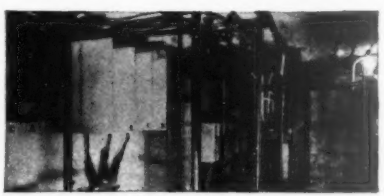
G. H. Slater, Plant Engineer of the Balmar Corp., inspects the General Electric 15-kv Type MI-6 metal-clad switchgear. Section lineup (left to right): Incoming line breaker, potential transformers, Power Co. metering, arc furnace feeder. Future plans call for two sections to be added to the right, one to the left, of the existing unit. Note neat appearance of metal-clad unit—it's space saving, too, and the metal-clad construction offers operating safety to personnel. And the three new sections will be added—when they are needed—with a minimum of fuss, bother, and expense.

Door of No. 1 compartment of metal-clad unit swung open showing magne-blast air circuit breaker (1200 amperes, 250,000 kva interrupting rating) in operating position. Magne-blast breakers are designed with adequate "IC" (Interrupting Capacity) for short circuit protection, are easily removed for inspection. Instruments and relays are co-ordinated for positive protection of high-voltage feeders.



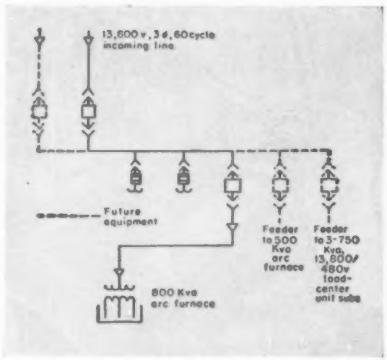
OBSOLETE

OBSOLETE



This old equipment was considered hazardous and deficient for present duties. Note dangerous, "spider-work" construction. Obsolete oil breakers of inadequate "IC" were seriously overloaded; in case of a bad short circuit could have exploded in a shower of flaming oil.

Metal-Clad Switchgear


13,800 v, 3 ø, 60 cycle incoming line
Future equipment
Feeder to 500 Kva arc furnace
Feeder to 3-750 Kva, 13,800/480v load-center unit subs
800 Kva arc furnace

Here's the one-line diagram showing the initial phase of changing over from 25 to 60 cycles at Balmar's Baltimore plant. General Electric 15-kv Type MI-6 metal-clad switchgear handles the incoming 13.8 kv through magne-blast air circuit breakers of 250,000 kva interrupting rating. Future plans call for another incoming line section, plus two more feeders.

The Balmar installation is a complete General Electric project—one source of responsibility, plus the very best in planning, engineering, manufacturing, and servicing facilities to give maximum savings and efficiency to the customer.

SEND FOR THESE HELPFUL BULLETINS

GEA-3083	Metal-clad Switchgear
GEA-4966	Low-voltage Metal-enclosed Switchgear
GEA-3592	Load-center Unit Substations
GEA-3758	Load-center Power Distribution
GEA-4507	Interlocked-armor Cable for Primary Circuits
GEA-4352	Flamenol Cable for Secondary Circuits

—*here's why . . .*

"As a part of our long-range plan of replacing old 25-cycle with new 60-cycle equipment we wanted completely metal-enclosed units to help eliminate danger to operating personnel. Our figures proved it was more economical to purchase a complete unit rather than a 'knocked down' substation. The cost of installing this metal-clad unit was negligible."

G. H. SLATER, PLANT ENGINEER, BALMAR CORP.

The Changeover at Balmar will continue over a period of years. This means only a small part of the total system capacity will be required during the early stages. A problem like this is easily solved with the General Electric load-center power distribution system that Balmar is using—it permits the installation of equipment as it is needed, and allows the over-all program to be accomplished in successive steps. This feature eliminates the necessity for tieing up large amounts of capital in equipment that would not be used to capacity for years to come.

The First Unit Installed was only large enough to handle its own load, plus a nominal margin for continuing the changeover program. As other units are added, this reserve becomes available for normal plant expansion and at no time will there be any large amount of unused capacity.

Modern Industrial Power distribution systems using G-E switchgear and load-center unit substations are applicable to any industrial plant or commercial building where you want full-voltage conditions for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs. A complete system, using G-E switchgear and load centers, costs you less than a "piece-meal," makeshift affair.

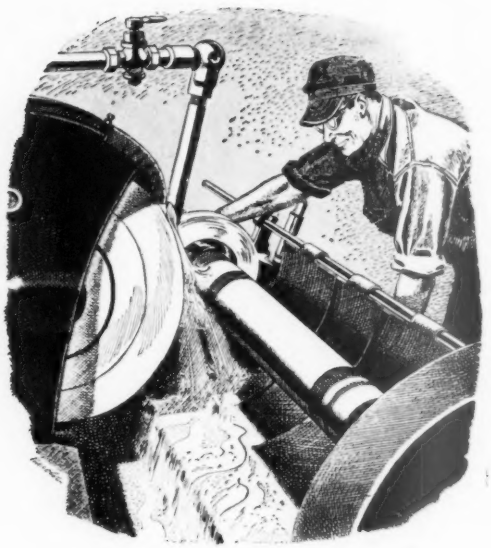
Investigate Today the many advantages of using General Electric switchgear and load-center unit substations in *your* plant for efficient, flexible power distribution. Contact your G-E sales representative for further information and write for the helpful bulletins listed at the left. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

860-87

A note on Abrasives

How Quality Control serves you every production hour



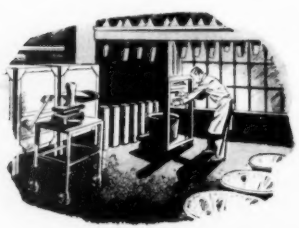
You can use and replace grinding wheel after grinding wheel... belt after belt... or disc after disc—depending upon the requirements of your work—and be sure that each replacement will continue to provide the same standards of abrasive performance. Your production continues on schedule.

These are the direct results of Quality Control in the production of abrasives by CARBORUNDUM. This control covers every step in the production of grain and the processing of belts, wheels, discs, and other abrasive products.

It assures abrasive particles of uniform grain size and classification. It guarantees that backings and bonds will perform as expected. Of primary importance, it assures consistent high quality and productive service in each abrasive tool. Because of our quality control, bonded or coated abrasives can be specified more exactly... and reordered, with confidence of dependable performance.

The continuation of efficient, high quality production is assured when you are using abrasives by CARBORUNDUM.

The Carborundum Company, Niagara Falls, New York.



The only complete line of Abrasive Tools is

CARBORUNDUM

TRADE MARK

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

Engineering News
ON ABRASIVE PRODUCTS

EFFECTIVENESS OF BACKSTAND BELT GRINDING

Used by a steadily increasing number of industrial plants and buffing and plating shops, the backstand belt grinding method offers practical production advantages and economies. It is particularly effective on operations ranging from rather heavy stock removal to the final polishing of surfaces preparatory to buffing. Consistently better finishes are obtained through the use of factory-coated abrasive belts. Units of work are completed in less time. The percentage of machine down-time is extremely low.

This increased efficiency has led to a 25% to 100% conversion to the belt backstand technique in plants which formerly used set-up wheels headed with abrasive grain.

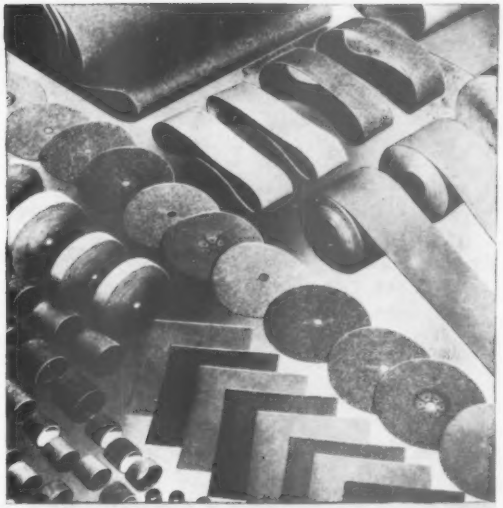
V20 BOND SEGMENTS

New V20 segments now make available a fast, cool, free-cutting abrasive for efficient, economical surface grinding applications. V20 segments are structurally uniform throughout; they perform with the same effectiveness during their entire life.

Because of their high degree of uniformity of structure, V20 segments incorporate greatly improved size holding characteristics and make possible the production of closely controlled surface finishes.

V20 segments offer the following advantages not found in competitive types of segments.

1. Cool and free-cutting qualities promote efficient production of burn-free finishes and close tolerances.
2. Uniform cutting qualities of V20 segments make possible close control of part size and finish and the establishment of controlled production rates.
3. Fast rates of cut obtained through the use of V20 segments save many dollars per year in operator and machine time on heavy production work.
4. More nearly self-dressing than other types, V20 segments offer savings in dressing time and usable abrasive.
5. Ability to grind a wide range of work of all sizes with larger table loads makes the surface grinder a more useful, efficient and profitable tool.
6. Successful use of V20 segments on nearly all types of metals including non-ferrous types makes possible reduced inventories in terms of gradings necessary for various types of work.
7. One grading can be used to grind a variety of materials successfully making it unnecessary to change segments when changing work thereby saving set-up time.



COATED PRODUCTS — SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS — ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS

FOR EVERY ABRASIVE APPLICATION
...CALL IN
CARBORUNDUM
TRADE MARK

Fafnir announces...

Spherical Roller Bearing

Pillow Blocks

As a further service to its customers, The Fafnir Bearing Company is adding a line of Spherical Roller Bearing Pillow Blocks to amplify its range of power transmission units. The Fafnir line will then provide for every conceivable pillow block requirement—speed, load and operating condition—in light, standard and heavy duty series—ball or roller bearing type.

The Spherical Roller Bearings for these units will be manufactured by The Torrington Company, well-known name in this specialized anti-friction bearing field. Fafnir Spherical Roller Bearing Pillow Blocks will be available *only* as complete units: Torrington spherical roller bearings will be sold only by The Torrington Company.

Fafnir Spherical Roller Bearing Pillow Blocks will be distributed in the same manner as Fafnir Ball Bearing Pillow Blocks. First shipments will be made about January 1, 1950. Literature listing the complete range of sizes and types will be available at a later date; meanwhile, your inquiry, with specifications and blueprints, is cordially invited.

The Fafnir Bearing Company
New Britain, Connecticut

For lowest-cost fuel handling

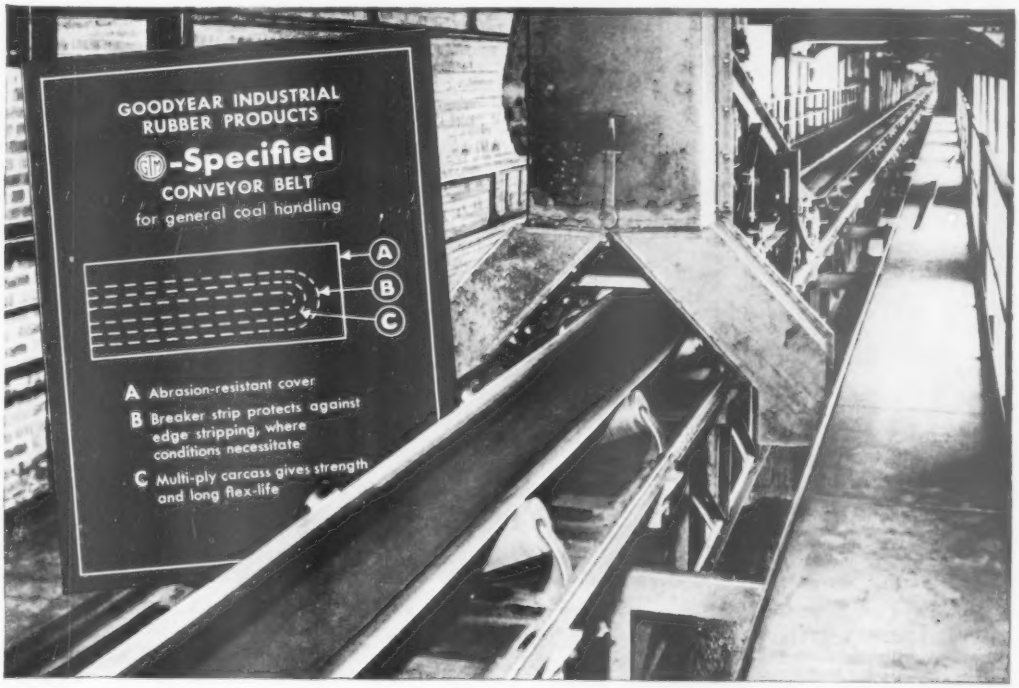
Specify GOODYEAR Belts

WHATEVER kind of coal you feed your boilers, you can handle it better — quicker — and at lower cost with Goodyear conveyor belts — from stock pile or unloading point to crusher to bunker.

Here's why. When you order a belt from the G.T.M.– Goodyear Technical Man — he draws on the experience of the world's largest maker of conveyor belts to specify the exact equipment for your needs — the belt that will handle *more* coal for *longer* periods at *less* cost.

The number of revolutions per hour, the frequency and severity of abrasion and flexing, the magnitude of impact to be absorbed by the belts, the physical and chemical properties of the materials to be conveyed — all these influence the G.T.M. in the selection of the proper belt to meet your needs. That's why Goodyear belts now in service have carried as much as 45,000,000 tons of coal — why a G.T.M.-specified fuel conveyor means lower-cost fuel handling — lower belt cost — higher plant efficiency at the bunker end.

Why not get in touch with the G.T.M. today? Call your nearest distributor of Goodyear Industrial Rubber Products, or write Goodyear, Akron 16, Ohio.



GOODYEAR

THE GREATEST NAME IN RUBBER

An Ad About An Ad

Maybe you saw it! . . .

An ad called, "The Fastest Man What Ever Ran" . . . it appeared in some of the big magazines last year.

Maybe you said, "Bosh! . . . Bet they don't settle claims *that fast!* Why, that's the tallest tale I ever heard!"

Well, I wouldn't blame you . . .

But here's what happened the very day that ad appeared on the newsstands.

One of our policy holders, a large trucking concern, had an accident on the open highway.

8 minutes later the local Mr. Friendly was on the scene . . .

And in less than 30 minutes the entire case was settled to the satisfaction of everyone!

I've said in some ads that we save businessmen mountains of money thanks to our special I. E. Loss Control Service*. . . which helps reduce accidents and premiums . . .

Well, sir, we can show you dozens of instances where we've helped reduce premiums for manufacturers (as much as 53%

AMERICAN MUTUAL...*the first American liability insurance company*

© 1949 AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

About Me! by Mr. Friendly

below average rate for the field in some cases).

When I talk friendly service in millions of magazine ads . . . every American Mutual man tries to give you the same friendly service!

With 77 offices in major cities, they can do it too!

The point is . . . Why not give your local Mr. Friendly a ring. See if he isn't as friendly and helpful as we claim he is!

See if he can't save you *more money*, through dividends and extra service.

And see how close our tall tales really are to down-to-earth reality!

A M

*Accident prevention based on principles of industrial engineering.

MAIL THIS COUPON NOW

Dept. F-26, American Mutual Liability Insurance Company
142 Berkeley Street, Boston 16, Massachusetts

Without obligation, please *rush* me my *free* copy of *The All-American Plan*, showing me how to save as much as 20% on practically every kind of insurance, except life. Also, a most helpful, free, illustrated 98-page book, *Foremanship and Accident Prevention in Industry*.

*Name*_____

*Street*_____

*City*_____ *State*_____

Here's what to look for in Unit Heaters

DISCHARGE AIR TEMPERATURE*

Midgets can't freeze . . . tall men won't melt in buildings heated by Modine Unit Heaters. Here's why. Modine's *right* combination of correct outlet temperature and sufficient air velocity heats *all* parts of a room uniformly, even in coldest weather.

Built-in adjustable radial deflector on vertical models lets you beam, flood or gently diffuse heat, at no extra cost.

Built-in velocity generator increases heat throw, lets most of warm outlet air disperse cold air near floor without increasing power needs.

**For maximum comfort and lowest operating cost, temperature of air leaving unit heater should be between 110°-120°F. at standard conditions.*

LOWER COSTS

Fuel bills are smaller when you heat with Modine Unit Heaters. Their sufficient air velocity and correctly related outlet temperatures combine to deliver heat down into comfort zones, don't waste it on ceilings.

High quality totally enclosed split-phase or capacitor motors (instead of less expensive shaded-pole type) are used on all but the smallest Modine Unit Heaters. *This means lower power and motor maintenance costs.*

Direct-from-pipe suspension is safe and practical with Modine horizontal models. *This cuts installation costs,* permits easy heat redirection over 360° range.

LONGER LIFE

Modines last longer! Entire condenser of pure copper and copper alloy gives you maximum resistance to corrosion. Tubes are red brass; fins and headers, copper. Parker-Bonderizing protects casings and sheet metal parts against rust formation.

Differential expansion stresses are safely absorbed in individual tubes . . . not transmitted to tube header joints to cause condenser fracture. Fins are permanently bonded to tubes. All condenser joints are brazed . . . no screwed or expanded joints to weaken condenser structure.

Modine
UNIT HEATERS

Yes, look beyond BTUs when buying Unit Heaters. Look to Modine! You can get all the facts by calling your nearest Modine Representative. He's listed in the classified section of your phone book. Or write direct. Modine Mfg. Co., 1505 Dekoven Ave., Racine, Wis.

Ask for the new Modine Unit Heater Bulletin 149A. Also available on special request is the informative booklet — "How to Evaluate Unit Heater Performance Characteristics." Send for them today!

U-1032

ELECTRONIC MEASURING EQUIPMENT

This equipment provides a reliable means for taking external and internal measurements with precision and ease that advance accurate manufacture and size control. By a simple turn of graduation selector, tolerances can be checked from "tenths" to "hundredths".

Exclusive advantages: any graduation value between .0001" and .00001" . . . separate amplifier completely isolates heat-producing elements . . . true linear response of amplifier permits accurate setting for entire scale with only 1 gage block . . . amplifier may serve several separate testing instruments.

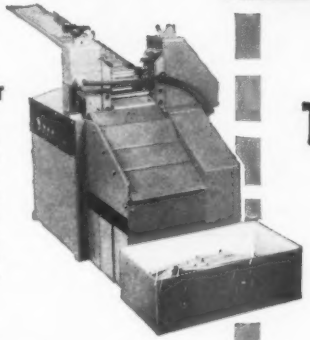
External comparator with range of 0-4". Simplified setting. One master only. Reversible anvil. Self-checking. Shock-protected. Diamond gaging point.

Internal comparator attachment for use with external comparator and amplifier . . . range ½" to 2". Frictionless. No parts to wear. Only one master.

Gage head cartridge for mounting in jigs, fixtures or similar testing pieces. Measurement range .002". Frictionless. Dust and moisture proof.

ELECTRONIC INSPECTION AND SORTING EQUIPMENT

Unique design . . . manual loading and disposal to fully automatic . . . custom-engineered at Brown & Sharpe to meet individual requirements. Simplification of parts and functions makes machines more compact, more dependable.



JOHANSSON GAGE BLOCKS

. . . world famous both for their extreme accuracy and for their fast-growing importance to manufacturing of interchangeable parts. These precision aids to quality control are made by Brown & Sharpe; from single blocks to complete sets and useful accessories, Jo-Blocks have hundreds of cost-saving uses.

Take your cost cutting cue from this *QUALITY CONTROL EQUIPMENT*

With any one of these modern quality control devices, you can lay the foundation for an efficient, cost-cutting quality control program. Each device offers thoroughly-proven features that broaden the advantages of quality control. All reflect the high precision standards associated with the Brown & Sharpe name. For complete details, write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE

$HORT CUT$

BY CHIEF BLACKHAWK

Here's Your Happy Answer to Many Testing Problems

Pressure Gauges Convert Blackhawk Hydraulic Jacks Into Test Instruments

This is another big reason why Blackhawk is "Industry's No. 1 Hydraulic Jack Line."

Blackhawk Jacks are easily equipped with gauges to solve many tricky laboratory, production or construction problems. These gauges "measure" the force exerted by the Jack — whether it be a few thousand lbs. or 200,000 lbs.

This compact, low-cost, simple equipment replaces large, costly, improvised arrangements otherwise needed to measure or test in terms of vast tonnages.

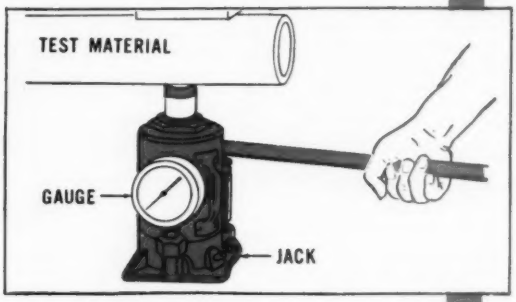
A Few of the Uses

Ingenious applications of Gauge-Equipped Blackhawk Hydraulics include:

- **Test breaking point of materials**
- **Check weights of large, cumbersome members**
- **Press plastics, foods, etc.**
- **Press parts together with cautionary predetermined pressure**
- **Test load-bearing qualities of soil**
- **Sink piling to pre-determined loads**
- **Draw cables to specified tension**

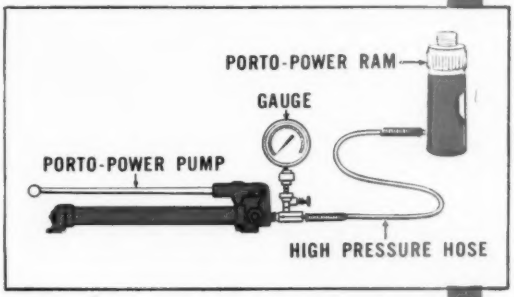
It's Easy to Order

There's nothing complicated about Blackhawk Gauge-Equipped Hydraulic Jacks. Order from your Industrial Supply Distributor or write us for literature.



TESTING the strength of materials. The gauge mounts into a standard Blackhawk Hydraulic Hand Jack and registers the force exerted.

FOR REMOTE MOUNTING — the guage can be connected to the Jack by copper tubing of any desired length.



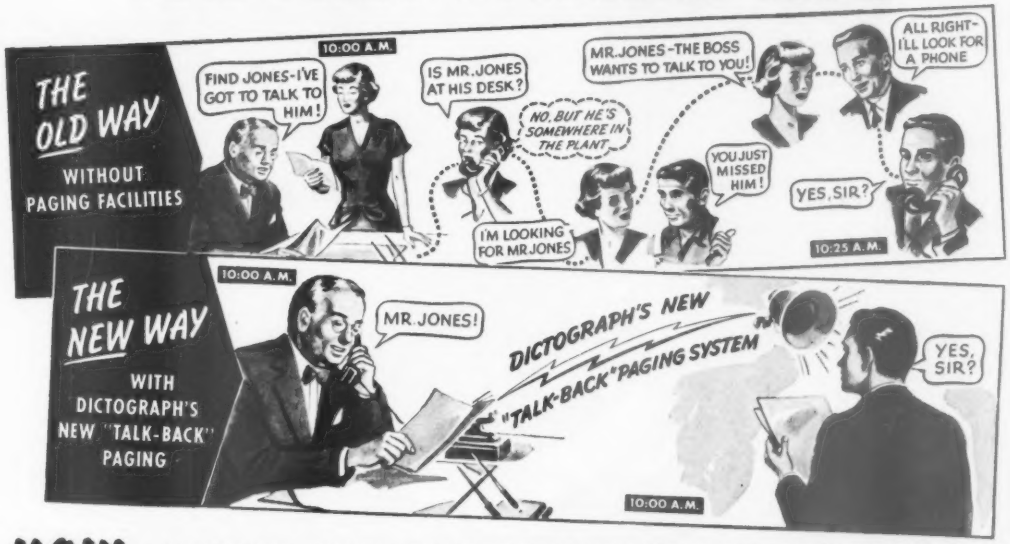
REMOTELY-CONTROLLED, all-directional "Porto-Power" Jacks can also be used with gauges. These jacks push, pull, press, bend, spread, and clamp. Gauges can also measure internal fluid pressure in P.S.I.

A Product of **BLACKHAWK MFG. CO.,** Dept. J-27109, Milwaukee 1, Wis.

BLACKHAWK®

HYDRAULIC EQUIPMENT • WRENCHES

New "Talk-Back" Paging System Cuts Plant Overhead Costs


THE OLD WAY
WITHOUT PAGING FACILITIES
10:00 A.M.
FIND JONES-I'VE GOT TO TALK TO HIM!
IS MR. JONES AT HIS DESK?
NO, BUT HE'S SOMEWHERE IN THE PLANT
I'M LOOKING FOR MR. JONES
MR. JONES-THE BOSS WANTS TO TALK TO YOU!
YOU JUST MISSED HIM!
ALL RIGHT-I'LL LOOK FOR A PHONE
YES, SIR?
10:25 A.M.
THE NEW WAY
WITH DICTOGRAPH'S NEW "TALK-BACK" PAGING
10:00 A.M.
MR. JONES!
DICTOGRAPH'S NEW "TALK-BACK" PAGING SYSTEM
YES, SIR?
10:00 A.M.

NOW—ANYONE CAN TALK BACK THROUGH LOUDSPEAKER —HIGH SALARIED PERSONNEL WALK LESS, WORK MORE!

ARE YOU INTERESTED in getting things done *faster* and *better* in your plant? Would you like to cut overhead costs? Step up the hourly productivity of your personnel? Then you will want to know about this important new electronic development.

At last the engineers of one of the world's largest intercommunication equipment manufacturers have developed a revolutionary new TWO-WAY PAGING SYSTEM that can keep *all of your key personnel* in close contact. This is the FIRST TIME that such a complete time-saving procedure has been featured.

You are INSTANTLY connected with any loudspeaker in your place. You page the person you want . . . *and he simply steps to the loudspeaker and answers!*

Saves Time, Money!

DICTOGRAPH, precision manufacturer of this *new kind* of paging system, has already installed them in many different plants throughout the country. Their success has been immediate, and it is not hard to see why.

Just think what it could mean to you and to your associate executives . . . to be able to hold a conversation with *anyone, anywhere in your plant, any time you wish.*

No longer need you wait impatiently . . . while a highly-paid man whom you have paged spends perhaps 5 minutes walking to a telephone and "getting through" to you. You won't need to send needed secretaries around through supply rooms, production lines, offices, halls, looking for an executive who has left his desk. Key personnel won't need to waste their time and energy in roving from department to department—they can talk to anyone they wish without moving from their posts. With a few spoken words, you can clear up a little problem that might otherwise require a whole series of time-consuming memos.

This new *two-way paging* method is just ONE advantage of the new DICTOGRAPH Cascade Sound System, a complete and surprisingly flexible installation for paging, public address, centralized music and radio. It enables you to add equipment at any time to meet your changing requirements, without discarding any amplifier equipment already installed.

Such an installation can pay for itself in a short time, in lopped-off overhead costs, in savings on long distance toll costs, overloaded switchboards and trunk lines. And it can contribute a strong lift to plant morale, an important factor in lowering production costs.

Our Expert Will Be Glad to Analyze Your Plant — Just Mail Coupon

Would you like a *free analysis* of your own organization's paging problems and requirements, by one of our communication experts?

Simply mail the coupon below. One of our trained representatives will study your plant and show you how a DICTOGRAPH paging system can streamline your entire staff contact. Needless to say, this personal analysis will not obligate you in any way. To get "first call" on the services of our staff, we suggest that you mail the coupon now. DICTOGRAPH PRODUCTS, INC., 580 Fifth Avenue, New York 19, N.Y.

Manufactured, Serviced, and Guaranteed by

DICTOGRAPH

One of the World's Largest Manufacturers of Intercommunication Equipment

You can depend on DICTOGRAPH for sound engineering, precision workmanship, correct installation, quick and reliable maintenance—all vital factors in weighing the worth of new plant improvements like the one described here.

DICTOGRAPH PRODUCTS, Inc.
Dept. T4, 580 Fifth Ave., New York 19, N.Y.

Will you please have one of your trained representatives call and show me how the new DICTOGRAPH two-way paging system can streamline staff contact in my establishment? It is my understanding this will not obligate me in any way.

Name.....

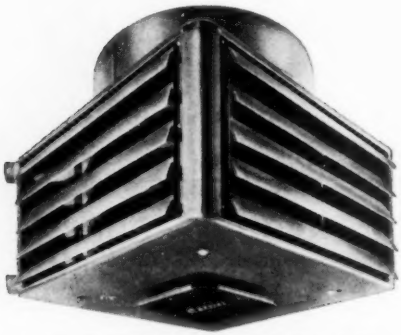
Position.....*Company*.....

Address.....

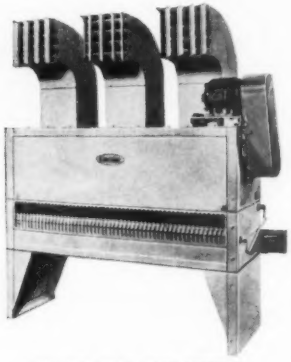
City.....*Zone No. (if any)*.....*State*.....

CARRIER 46U HORIZONTAL DISCHARGE UNIT HEATER
New single-row coil construction offers less air resistance and facilitates cleaning. Capacities range from 13,400 to 200,000 Btu's per hour.

CARRIER 46T GAS-FIRED UNIT HEATER
Heat exchanger *and* combustion chamber of Aluminized Steel welded into one leakproof assembly. Capacities range from 70,000 to 230,000 Btu's per hour input.



CARRIER 46S FOUR-WAY DIRECTED-FLO UNIT HEATER
Air discharges from 1, 2, 3 or 4 sides give maximum flexibility in distribution. Capacities range from 49,000 to 500,000 Btu's per hour.



CARRIER 46PQR HEAT DIFFUSER
Note the multiple air discharge outlets with adjustable louvers. Capacities range from 115,000 to 1,570,000 Btu's per hour.

Only Carrier offers this full line of fuel savers

If it's an industrial or commercial space heating installation, choose Carrier Unit Heaters. There is a style, type and size of unit to fit a wide variety of jobs, conditions and fuels — steam, hot water or gas.

Pick the completely new, attractively styled steam or hot water Carrier Horizontal Discharge unit for beauty shops, exclusive stores, and other quality buildings where appearance and quietness count. Sturdy and efficient, too, it is your best heating investment for garages, factories and other industrial spaces.

The Carrier Four-Way Directed-Flo unit (steam or hot water) provides quick heat from relatively high ceiling suspension — directed and controlled in any quantity and at any angle.

Wherever gas is available, the new Carrier Gas-Fired Unit Heater is the answer to clean, economical heat. Requires no pipes, no ducts, no boilers. For factories, offices, warehouses and other types of buildings.

For ventilating as well as heating large areas, install Carrier Heat Diffusers, either floor, wall or ceiling mounted. Their multiple discharge outlets with adjustable louvers permit air to be delivered in practically any direction.

Field-tested design and high-quality construction are your guarantee of efficient, economical heating with every Carrier Unit Heater. And Carrier's recognized experience and engineering skill are plus values. Carrier Corporation, Syracuse, New York.

Carrier AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING

WICKWIRE ROPE

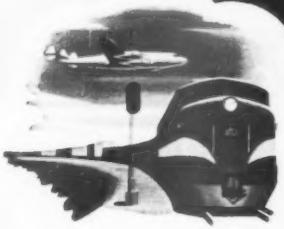
A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

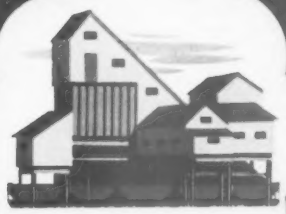
In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® *Pre*formed. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

IN THE EAST—Wickwire Spencer Steel Div. of C. F. &I.
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1080—19th Ave., Oakland 6, Cal.

LOGGING



TRANSPORTATION



MINING

PETROLEUM

MANUFACTURING

MARINE

CONSTRUCTION

Are YOU Wasting Money in Inventory?

WHEN production inventories are being closely watched, as now, are you tying up needless money in inventory for maintenance? Your Distributor carries a maintenance inventory for you. In his stock are all the many things needed to keep your production moving, including Bronze Bars and Bronze Bearings—Bunting Bronze Bars and Bearings.

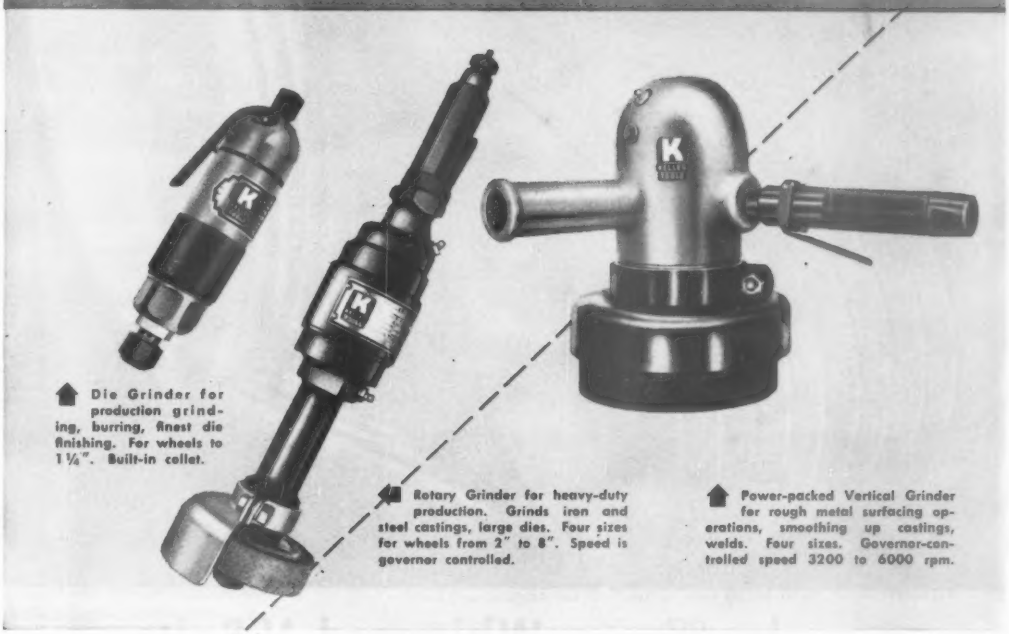
You do not need to duplicate, in your plant, an inventory which your Bunting Distributor is already carrying as a normal, natural part of his function. Nor can you expect to rival the completeness of his Bunting Stock without needlessly tying up your capital.

Your Distributor is prepared to serve you and interested in doing so. The leading Distributor in your area is,—almost certainly,—the Bunting Distributor. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities. BV

Bunting®

BRONZE BEARINGS · BUSHINGS · PRECISION BRONZE BARS

Your ...GRINDING COSTS CUT ...WORK QUALITY IMPROVED ...WORKER FATIGUE REDUCED



Die Grinder for production grinding, burring, finest die finishing. For wheels to 1¼". Built-in collet.

Rotary Grinder for heavy-duty production. Grinds iron and steel castings, large dies. Four sizes for wheels from 2" to 8". Speed is governor controlled.

Power-packed Vertical Grinder for rough metal surfacing operations, smoothing up castings, welds. Four sizes. Governor-controlled speed 3200 to 6000 rpm.

ALL ACCOMPLISHED WITH KELLER PNEUMATIC GRINDERS

When Keller Grinders are on the job, workers anticipate continuous high-speed performance. Here are some other noteworthy features that contribute to the rising poularity of these power-packed tools:

They have compact, one-piece housings, few working parts, all readily accessible for low-cost maintenance.

They are comfortable to hold during tedious, time-consuming jobs, thus lessening worker fatigue. Start and stop from touch. Governor control of speed gives extra power when needed.

There's a model for every need . . . from heavy-duty jobs to those requiring intricate and detailed finishing.

One manufacturer says: "It paid us to switch to Kellers. Their steady precision drive cuts production time and costs, banishes worker fatigue."

K KELLER TOOLS

KELLER

Pneumatic Tools

KELLER TOOL COMPANY, GRAND HAVEN, MICHIGAN

. . . in *Condor* Whipcord V-Belts

In a multiple groove drive such as the rugged installation shown here, V-Belt engineering plays an important part. Every belt must pull its share of the load. Otherwise, some belts are overloaded and drive failure results. The more important the job, the more dependable every V-Belt must be.

That is why Raybestos-Manhattan engineers designed Condor Whipcord V-Belts to be better, not merely in one or two features, but in *eight* ways . . . and at the top of the list is "Wide Margin of Strength" . . . This means extra value for your V-Belt investment—and less money lost on machinery shutdowns for premature replacements. *Keep Ahead with Manhattan.*

Buy a set of Condor Whipcord V-Belts and let them prove their quality.

8 ADVANTAGES

1. Wide margin of strength
2. Minimum inelastic stretch
3. Uniform flexibility
4. Maximum resistance to structural breakdown
5. Smooth running
6. Maximum traction
7. High resistance to side wear
8. Correct lateral reinforcement

RAY-MAN V-BELTS engineered for Your TOUGHEST Drives . . . Oil-Proof, Non-Spark, Heat-Resistant

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

8 reasons why you should choose Maxi-Power Drives

1. HIGH QUALITY GEARING

Alloy steel gears and pinions with gear teeth generated to greater accuracy. Improved methods of heat-treating give increased strength—longer life.

2. HIGH EFFICIENCY

Antifriction bearings — improved accuracy of gears — maintained accurate alignment —effective lubrication assures operating efficiencies.

3. DEPENDABLE PERFORMANCE

Improved design, rugged construction, highest quality materials, accurate manufacture to close tolerances, all assure extreme ruggedness necessary for heavy-duty service over long periods.

4. SMOOTH OPERATION

The overlapping tooth action of the extremely accurate gears, plus close back lash tolerances, provides smooth, quiet operation.

5. MORE POWER—LESS SPACE

The careful engineering, quality manufacture and the use of finest materials permit the selection of a smaller size unit than was previously necessary.

6. POSITIVE LUBRICATION

All gears and bearings are lubricated from a large oil reservoir by a simple, efficient system. Oil seals at all shaft extensions provide oil-tight construction—clean operation.

7. APPLICATION ADAPTABILITY

Many combinations of shaft assemblies permit a wide variety of arrangements of gear drives between prime mover and driven equipment. Any prime mover may be used.

8. WIDE RANGE OF SIZES AND RATIOS

Single, double, and triple units in a range of 42 sizes. Standard ratios from 2.08 to 1 up to 360 to 1. h.p. up to 1350.

More Power in Less Space

WITH THE NEW MAXI-POWER DRIVES

High quality, rugged dependability characterize this new line of enclosed helical gear drives—Maxi-Power by Foote Bros.

These drives are available in single, double, and triple reductions in a wide range of sizes and ratios.

Mail the coupon for Bulletin or call Foote Bros'. representative in your city.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 S. Western Blvd. • Chicago 9, Ill.

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. 1, 4545 South Western Boulevard, Chicago 9, Illinois

Gentlemen:

Please send me Bulletin MPA on Foote Bros. MAXI-POWER DRIVES

Name .....

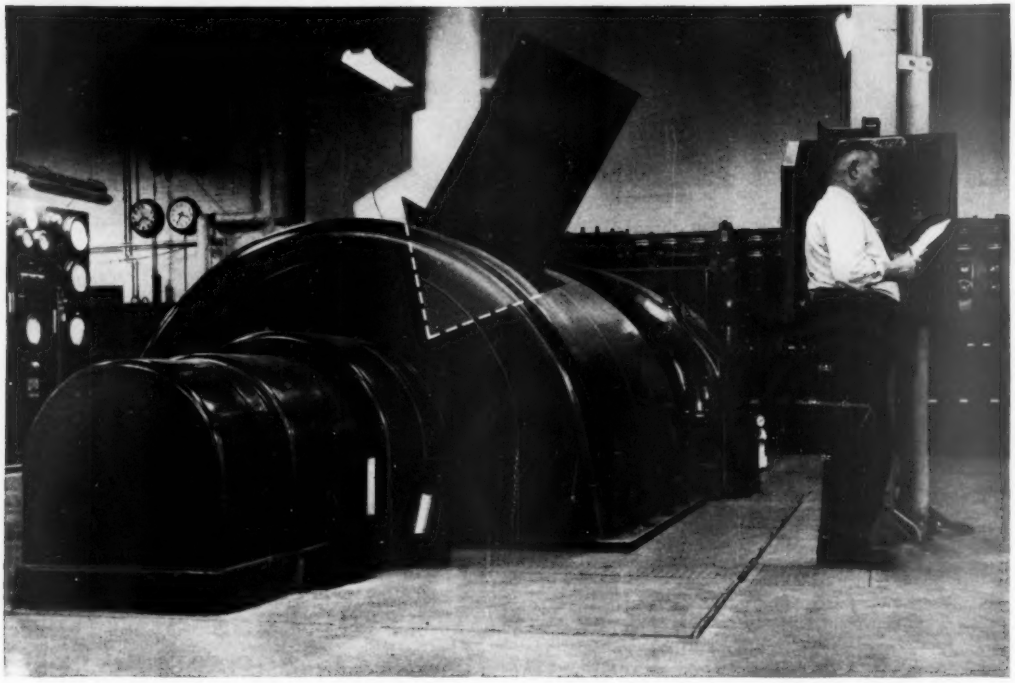
Title .....

Company .....

Address .....

City ..... Zone ..... State .....

Under the skin of many a generator...



...fire threats are smashed with CO_2

Like thousands of other generators in power plants all over the world, these two units of The Ohio Box Board Company at Rittman, Ohio, are protected against the threat of fire by *Kidde** Built-in Systems.

If fire should start inside one of these generators, a heavy initial discharge of carbon dioxide (CO_2) from the *Kidde* System can extinguish any active flame within a few seconds. No danger that damage to the insulation will spread!

To prevent any possibility of a reflash, a continuing discharge of CO_2 maintains an inert, fire-suffocating atmosphere inside the generator during the run-down period.

Of course, there's no *extinguishing-agent* damage with a *Kidde* System. The CO_2 does not corrode metal or harm insulation.

Do *you* have a fire-protection problem? Whatever its nature, a Kidde representative will help you.

When you think of CO_2, call Kidde!

*Also known as "LUX"

The words "Kidde" and "Lux" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

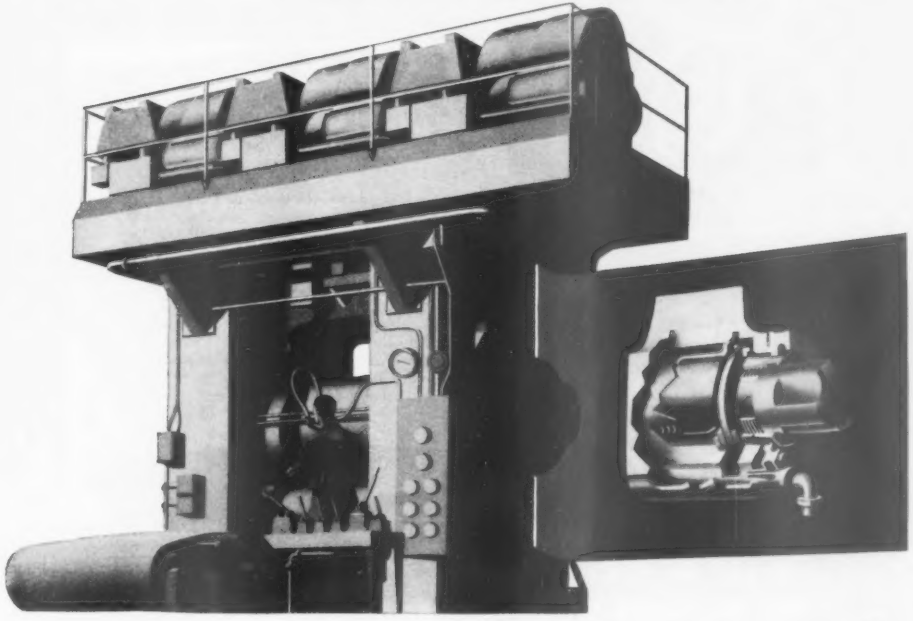
K Kidde

Kidde

Walter Kidde & Company, Inc. • 1032 Main Street, Belleville 9, N. J.

GULF I-C OIL

provides outstanding protection for back-up roll bearings in Metal Rolling Mills



One of the many ways that industry makes multiple savings with Gulf Quality Petroleum Products

Modern metal rolling mills in the U. S. are usually equipped with oil-lubricated back-up roll bearings, selected for their high load-carrying capacities, rugged construction, and smooth operation at all speeds.

The bearing circulating systems of many of these mills are filled with Gulf I-C Oil, noted for its stability and excellent water-separating characteristics. A typical example of its wide acceptance—Gulf I-C Oil was selected for the new reversing hot strip mill at Crucible Steel Company's Midland Works, one of the most recent installations to be put in operation in the industry.

Gulf I-C Oil is fully approved by the manufacturers of oil-type back-up roll bearings and by scores of the country's leading mills. With this quality product, bearings get full protection at any operating speed and maintenance costs are low.

Gulf I-C Oil is one of more than 400 Gulf quality oils and greases that are helping industry maintain production and reduce costs. Make sure you are getting the advantages of all recent developments in petroleum science. Call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

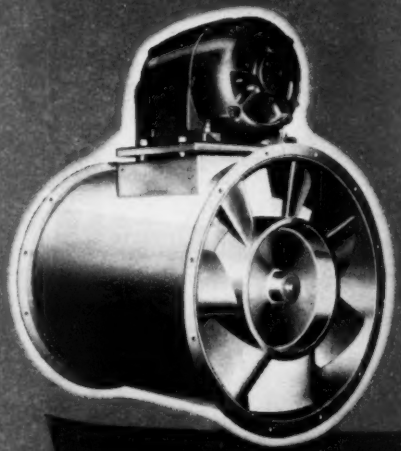
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF MAKES AVAILABLE TOP QUALITY PASSENGER AND TRUCK TIRES . . . ASK YOUR GULF REPRESENTATIVE.

GULF INDUSTRIAL LUBRICATION

Helps make machines produce more at lower cost

Hartzell Vaneaxial Blower

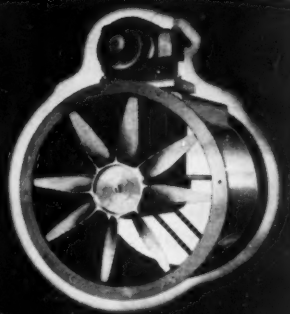


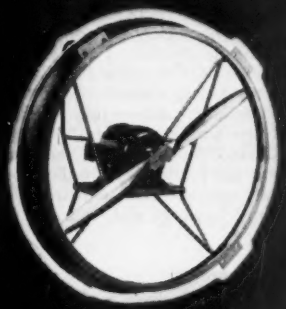
Prices Reduced

If you've got a job of moving air against heavy pressure, just check the new low prices we've put on the Hartzell Vaneaxial Blower! In every size, every capacity, it's a mighty good buy. Always has been, because it installs easily, quickly, and gives you extra air per dollar, year after year, without trouble. Now the initial cost is cut, too. It's ***really*** a buy. Your Hartzell representative has cost-cutting figures for you. Write for his name, address.

EVERY PENNY MOVES A LOT OF AIR... The Hartzell Way

Hartzell makes pennies count when it comes to moving air. Whatever your air-moving needs, there is a Hartzell fan, blower or ventilator to meet it economically. No makeshift adaptations, no "just-as-good." And your power-penny goes a long, long way . . . lasts a long, long time. Hartzell initial costs are reasonable . . . Hartzell costs per foot of air moved, or per year, are amazingly low. Use the experience of your Hartzell representative to get maximum air at minimum cost.





HARTZELL
PROPELLER FAN CO.
PIQUA DIV. OF CASTLE HILLS CORP. OHIO

CHARTER MEMBER PROPELLER FAN MANUFACTURERS ASSOCIATION

PROPELLER-TYPE FANS AND BLOWERS • ROOF VENTILATORS • UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

NOW a 50-ampere Contactor FOR SMALL SPOT WELDERS

CLASS 8990 TYPE DG-1
SIZE OW WELDER CONTACTOR

SAVE 3 WAYS

WITH NEW SQUARE D HIGH SPEED CONTACTOR

- LOW COST
- SMALLER SIZE
- MINIMUM MAINTENANCE

Specify new CLASS 8990 TYPE D MAGNETIC WELDER CONTACTORS to handle transformer primaries of spot welders rated approximately 10 KVA, 220 volts; 20 KVA, 440 volts and less. For fully automatic control at minimum expense use them with Square D's popular Safront timers.

Simple vertical action, short stroke, hardened parts, and complete accessibility contribute to long life with low maintenance cost. Contacts and coils are interchangeable with Square D Size II motor starters.

For installation economy, device is single pole with two double-break contacts in series, giving high interrupting capacity.

The BEST Resistance Welder Control?

● There is no one type. Square D builds both magnetic and electronic controls of many types—each best suited to certain types of applications. Specify Square D, and be sure of getting the best for your job.

HIGH SPEED CONTACTORS
MOTOR DRIVEN TIMERS
Safront TIMERS

Electronic TIMERS & CONTACTORS
SYNCRO-BREAK CONTACTORS
SYNCHRONOUS-PRECISION COMBINATION CONTROLLERS

TYPE TBS-6 SAFRONT WELD TIMER for foot-operated machine

Write for BULLETINS 8990 and 211 on contactors and BULLETIN 210 on Safront timers. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

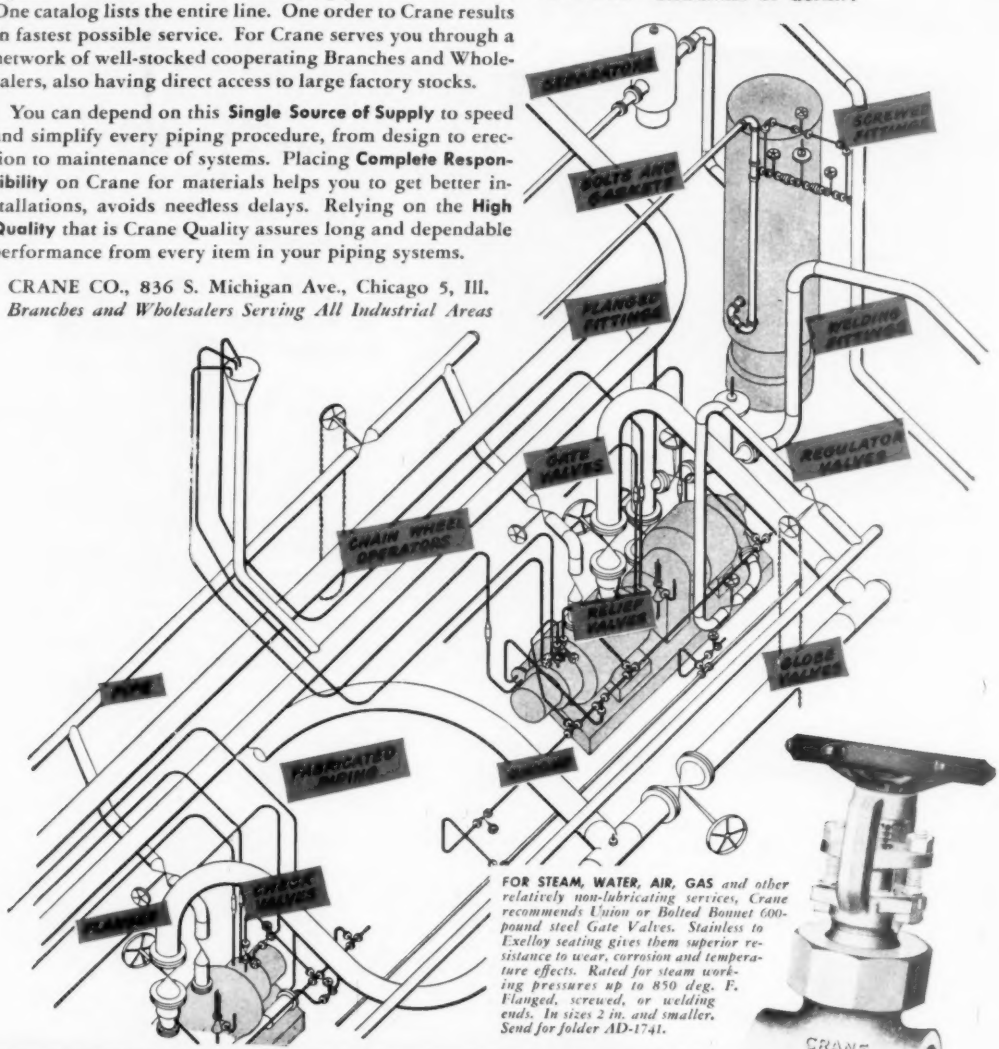
For every fluid . . . or working condition CRANE piping meets the need

For This Boiler Room Piping, for example . . . as for any pressure or temperature condition . . . Crane offers an unequalled selection of valves, fittings, pipe and accessories. One catalog lists the entire line. One order to Crane results in fastest possible service. For Crane serves you through a network of well-stocked cooperating Branches and Wholesalers, also having direct access to large factory stocks.

You can depend on this **Single Source of Supply** to speed and simplify every piping procedure, from design to erection to maintenance of systems. Placing **Complete Responsibility** on Crane for materials helps you to get better installations, avoids needless delays. Relying on the **High Quality** that is Crane Quality assures long and dependable performance from every item in your piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



FOR STEAM, WATER, AIR, GAS *and other relatively non-lubricating services, Crane recommends Union or Bolted Bonnet 600-pound steel Gate Valves. Stainless to Exelloy seating gives them superior resistance to wear, corrosion and temperature effects. Rated for steam working pressures up to 850 deg. F. Flanged, screwed, or welding ends. In sizes 2 in. and smaller. Send for folder AD-1741.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

LOOK AT THIS PRESS

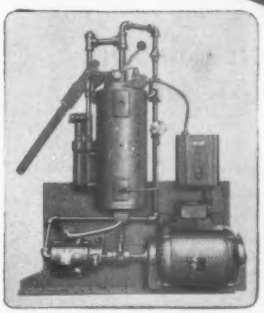
It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation . . . relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24″—31″—36″—42″ respectively. Available in special width up to 72″ at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. Presses available for either vertical or horizontal operation. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard.* Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

Presses include V blocks, Gauge, Motor Controls, Pressure Regulator, etc., complete and ready to attach to electrical source.



MODERNIZE AND MOTORIZE YOUR PRESENT KRW PRESS with one of these compact motor drive units. They come complete ready to connect to your press. Require very little extra floor space. Write for conversion unit prices, giving the capacity and serial number of your press.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

MAIL THIS COUPON

It will bring you all the money-saving facts about these low cost, high production hydraulic presses. Now is the time to get ready for the highly competitive days ahead.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y. (81)

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

Name .....

Address .....

City and Zone ..... *State* .....

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

Test your Brush I.Q.

No. 4 in a Series

Black and white bristle used for this photograph to emphasize the layers of bristle as they are laid out

What is the greatest test of skill for a bristle expert?

Formulating the bristle batch. Each kind and length of bristle has its own characteristic working qualities. Selecting and combining the various bristles require years of first-hand information and knowledge because the working qualities of the finished batch have to be pre-determined.

Fortified by a thorough knowledge of painters' needs and brush requirements, Pittsburgh's skilled bristle craftsmen have put into use over 2200 batch formulas! Every batch is designed for maximum efficiency and long life.

PITTSBURGH—
Produces the Most Complete Brush Line in the Industry!

Painting . . . Finest bristles go into Pittsburgh's Gold Stripe, Bristle-Neoceta and Nylon brushes. They're made to wear and wear! And for *real* economy in these days of rising costs, why not try a Bristle-Neoceta? You'll do your job faster, better!

Maintenance . . . Pittsburgh's "Lightning Line" sets a new standard for staple-set brushes! These demon workers are rugged! They work harder, last longer!

Industrial . . . This same *know-how* has been applied to Pittsburgh's power-driven brushes. Pittsburgh maintains a crew of skilled engineers to work with you in developing any type brush to meet your specifications. Write or call Pittsburgh Plate Glass Company, Brush Division, Baltimore 29, Maryland.

***One Source—One Quality—One Name to Remember*—PITTSBURGH**

BRUSHES FOR INDUSTRY

BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Here's the Outstanding DC Arc-Welder Development of All Time

The *New* P&H NEMA-Rated Model WFA 300

(Welding Service Range 60-375 amps)

The only DC Welder with time- and money-saving Dial-lectric control — a compact, light-weight unit that runs at the life-preserving speed of 1750 rpm.

Here's a DC welder that can reduce your welding costs . . . P&H's new model WFA 300.

Just check these features:

LIFETIME SEALED BEARINGS —no lubrication needed.

PUSH-BUTTON START AND STOP SWITCH —overload protection.

CLASS B GLASS INSULATION — highest quality available.

COMPACT DESIGN — uses little or no floor space.

DUAL-FAN COOLING SYSTEM — the coolest welder you have ever seen.

STATIONARY OR PORTABLE MOUNTINGS.

LOWEST RPM PER POUND OF WEIGHT

QUIET — you hardly know it's running.

REMOTE CONTROL — full arc control at the work.

DIAL-LECTRIC CONTINUOUS CONTROL

POLARITY SWITCH — an extra feature at no extra cost.

HIGH-LOW RANGE — requires only a flip of a switch.

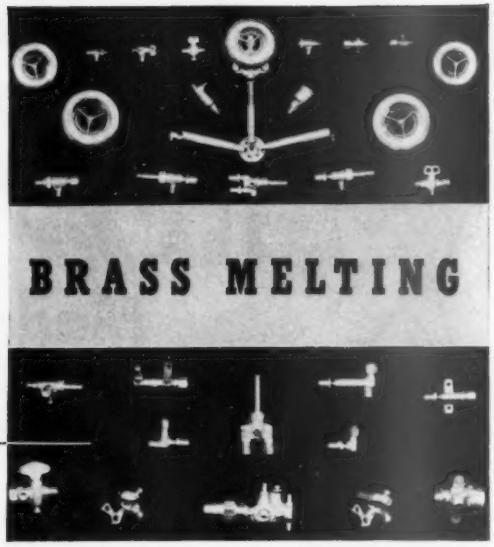
GREATER MOBILITY — only 695 lbs.

Get all the facts about this new, outstanding DC Welder. Call your P&H representative or write us for Bulletin W-80.

P&H ARC WELDERS
4525 W. National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

Conversion of Crucible Furnaces at LINCOLN BRASS WORKS, INC. Demonstrates Efficiency and Economy of GAS



CONVERSION of brass-melting crucibles for Gas-firing resulted in three-way operating economy at Lincoln Brass Works, Inc., Detroit. By effective utilization of the fuel the company accomplished

- **33% decrease in melting time**
- **20% reduction in fuel costs**
- **Definite savings in maintenance expense**

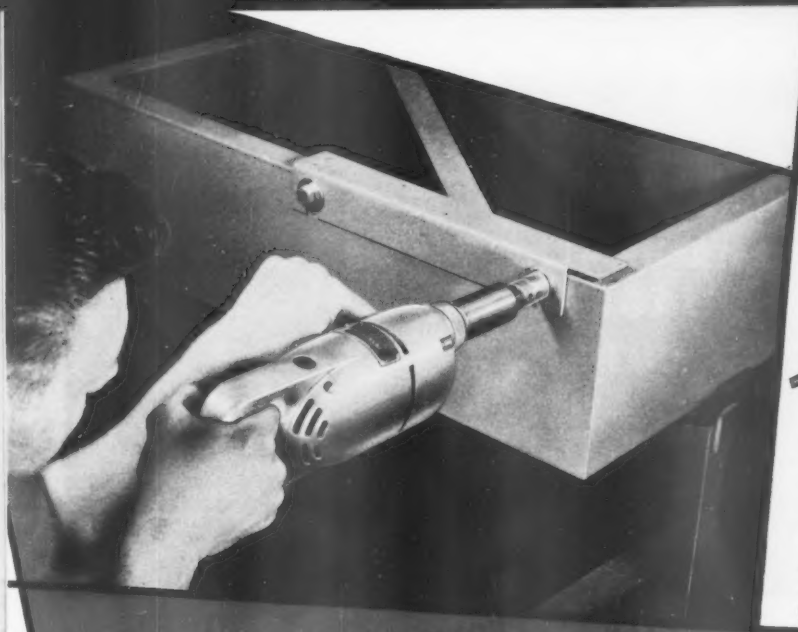
An important producer of brass valves and fittings for automotive, marine, industrial, Gas appliance, and farm equipment fields, Lincoln Brass Works is constantly modernizing its manufacturing methods. The conversion of its eighteen crucibles to GAS was a major improvement which Secretary-Treasurer John H. Mueller describes,

"In addition to the increased melting capacity and lowered fuel costs, we have been getting cleaner metal with Gas-firing. We are now able to keep up production without using all 18 furnaces so we always have some stand-by capacity. You must remember, too, that workmen like GAS because it makes the foundry cleaner and healthier."

In brass melting, as in virtually every production-line heating operation, the productive flames of GAS perform the heat-processing tasks rapidly and economically under completely automatic control. Be sure to consult your local Gas Company for recommendations on the effective utilization of GAS.

Section of the brass-melting department showing nine of Gas-fired pit-type crucible furnaces.

MORE AND MORE...
THE TREND IS TO GAS
FOR ALL INDUSTRIAL HEATING
AMERICAN GAS ASSOCIATION
420 LEXINGTON AVENUE, NEW YORK 17, N.Y.



The big SKIL Driver line offers you the right tool for every production job!

MODEL "303"

Compact, powerful for continuous one-hand driving of nuts and screws in metal and compositions. *Capacity:* Machine screws and nuts up to ¼ in. diam. Self-tapping screws up to No. 12. Adjustable clutch.

MODEL "304"—Same as above with positive clutch. Wood screws up to No. 12.

Run down nuts and screws . . .

Run up production and profit records with SKIL Drivers

MODEL "308"

One of the most compact ½-inch screw drivers and nut setters available. Light, perfectly balanced. Side handle for precise control.

Capacity: Machine screws and nuts up to ½ in. diam. Self-tapping screws up to ⅜ in. diam. Adjustable clutch.

MODEL "309"—Same as above with positive clutch. Wood screws up to No. 20.

Look at their superior design . . . look at their superior features and you'll understand why production climbs and costs tumble with SKIL Drivers on the job. Powerful Universal motors in light, compact housings mean speed and easy handling. 100% anti-friction bearings throughout mean smooth operation and long wear. Available in a range of types, sizes and capacities to give you just the right SKIL Driver for each of your jobs. Ask your SKIL Tool Distributor for a demonstration *today*.

MODEL "312"

Suspension type for assembly of radios, toys, appliances, etc. *Capacity:* Machine screws and nuts up to ¼ in. diam. Self-tapping screws up to No. 12. Adjustable clutch with slide switch.

MODEL "316"—Same as above with paddle switch.

MODEL "313"—Same as "312" with positive clutch. Wood screws up to No. 12.

MODEL "317"—Same as "313" with paddle switch.

SKIL Tools
TRADE MARK

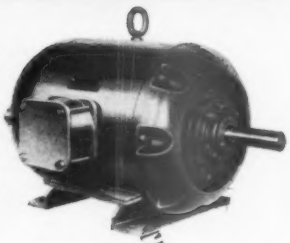
SKIL TOOLS ARE MADE ONLY BY
SKILSAW, INC.
5033 Elston Avenue, Chicago 30, Ill.
Factory Branches in Principal Cities

wherever motor hazards lurk... Specify WAGNER PROTECTED MOTORS

Do you use motors in locations where dirt, filings, moisture, splashing liquids, acid fumes, explosive gases, or other motor hazards lurk? No matter how severe the operating condition, Wagner has the right motor for your purpose—adequately protected against such hazards. Five types of Wagner protected motors are shown below.

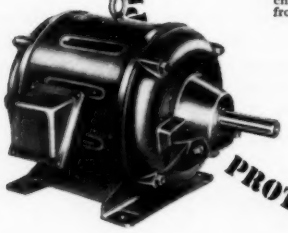
PROTECTED • PROTECTED

1. Wagner Totally-Enclosed Motors . . .
PROTECTED against dust, dirt, abrasives, steel chips, filings, acid fumes, and other harmful elements that may damage the windings and bearings.



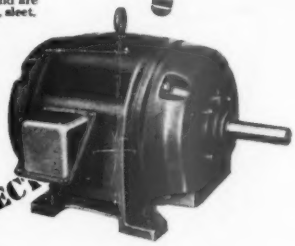
2. Wagner Explosion-Proof Motors . . .
PROTECTED to prevent explosion in locations where gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas are manufactured, used, or handled. Approved by Underwriters' Laboratories for Class I Group D hazardous locations.

PROTECTED



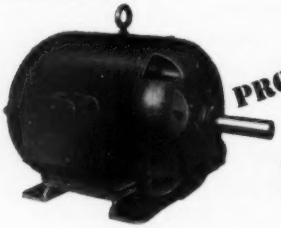
3. Wagner Drip-Proof Motors
PROTECTED to keep dripping liquids, falling metal chips and other particles from entering the motor.

4. Wagner Splash-Proof Motors . . .
PROTECTED against splashing or dripping water, oil, or other liquids. They are widely used in exposed outdoor locations, and are completely self-protected against ice, sleet, snow and rain.



PROTECTED

5. Wagner Chemical Plant Motors . . .
PROTECTED to resist the action of acids, fumes, moisture and other harmful elements encountered in chemical manufacturing.



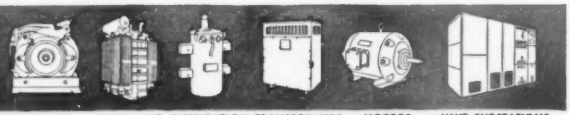
PROTECTED

Bulletin MU-185 gives full information on the complete line of Wagner Motors. Write for your copy today.

Wagner Electric Corporation
6412 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

Consult Wagner Engineers on all Electric Motor Problems

Wagner Electric Corporation EST. 1891

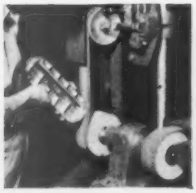


BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

M49-18

Dust chutes cause no interference with large pieces.



Guard raises, or swings clear, to expose any part of belt.

Platen in up-position provides flat working surface.

Easily made into a buffing machine, for many jobs.

With platen down, pieces are worked from under belt.

new!

Low cost! Portable! Takes little floor space! Does many metal-removing operations formerly requiring heavy, expensive machines!

DELTA® *Belt* Grinding, Polishing, and Deburring Machine

$130.75

without adjustable guards, dust chutes, motor, switch, or switch rod.

Price subject to change without notice.

Available in models to suit varying needs See Bulletin AD369

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

Can be used to do all this—and more!

- Clean out slots
- Remove flash in corners
- Remove fins
- Smooth up crowns
- Remove nibs
- Remove parting lines
- Chamfer corners

DELTA MILWAUKEE®

You speed up flashing, grinding, cleaning, and polishing, with this new Delta *Belt* Grinding, Polishing, and Deburring Machine. You save time, labor, and material.

In this condensed unit on a welded steel stand, you get a production machine at low initial cost. With accessories to meet your particular requirements, it does hundreds of different jobs.

● There are no set-up wheels to bother with; no grinding wheels to dress. Instead, you use coated abrasive belts that are inexpensive, long-wearing, quick and easy to replace.

The Delta *Belt* Grinding, Polishing, and Deburring Machine is carefully engineered for long, trouble-free service. Delta quality features assure you of that: Preloaded, lubricated-for-life ball bearings. Precision-bored bearing seats. Dynamically-balanced pulleys. All-around rugged construction. Delta Dust Collector available for use with this unit protects workers' health and expensive machinery.

Make metal-removing fast and economical. Put Delta *Belt* Grinding, Polishing, and Deburring Machines to work for you on your production line—and in your inspection department, to clean up imperfections on the spot.

Have your nearby Delta distributor show you this new machine. Send coupon for free Bulletin AD369.

Ask your distributor about easy time-payment plan!

POWER TOOL DIVISION
ROCKWELL MANUFACTURING CO.
MILWAUKEE 1, WISCONSIN

TEAR OUT COUPON AND MAIL TODAY!

Power Tool Division, ROCKWELL MANUFACTURING CO.
618L East Vienna Avenue, Milwaukee 1, Wisc.

Send me free copy of Bulletin AD369.

Name.....

Title.....

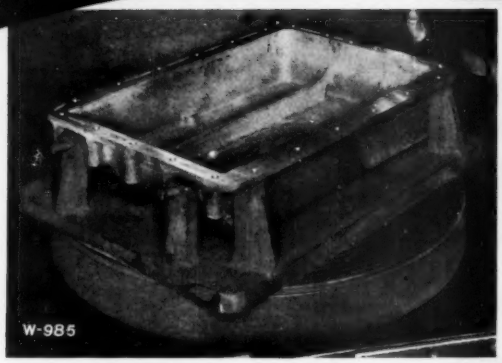
Company.....

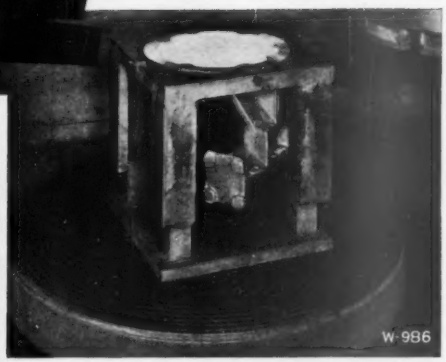
Address.....

City.....(.....) State.....

WM-26

DO IT THE *Easy* and *Profitable* WAY





Here are three excellent examples of large irregular pieces being finished more easily and more profitably on Blanchard Surface Grinders, by the use of specially designed, extraordinarily simple, low cost holding fixtures. If the surface to be finished can be brought to the wheel, holding fixtures can be designed to hold the work for Blanchard Grinding.

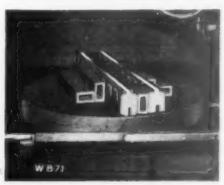
Blanchard will gladly assist you in designing such holding fixtures, or design and furnish them at low cost.

Put it on the BLANCHARD

HOW ELSE CAN YOU GET RESULTS LIKE THESE?

W-894 Cast iron chain idler brackets were ground from rough casting to commercial finish. Grinding reduced the per-piece machining time to 3/10 that necessary when a miller was used. It was put on the Blanchard.

W-957 Ten costly hours were saved finishing this milling machine universal saddle. Formerly an 11-hour hand-scraping operation, the time was slashed to 50 minutes. It was put on the Blanchard.



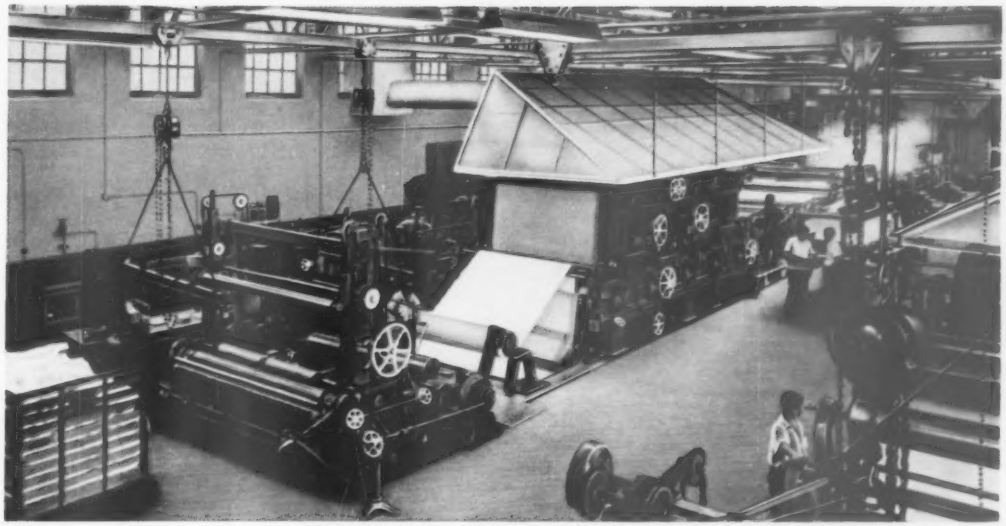
W-871 These cast iron Bearing Gibs had ⅛" removed from each of the four sides. Finished edges were accurately square with sides. Production rate was tripled. They were put on a Blanchard.

Send for your free copies of "Work Done on the Blanchard" and "The Art of Blanchard Surface Grinding"

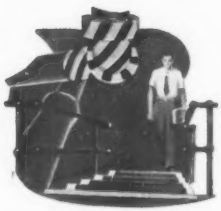
BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



BETTER WORKING CONDITIONS! Smith Paper, Inc., Lee, Mass. uses Color Conditioning Green on sidewalls to psychologically overcome the high heat and humidity present in paper mills. Light grey on the machinery maintains proper degree of "brightness"... lets workers see what they are doing.



SAFETY! Du Pont Safety Color Code "points up" hazardous areas... helps prevent personal injury. Colors and symbols quickly identify first-aid and fire protection equipment.

MORALE! Pleasant surroundings give workers a "lift," pay off in better work. Throughout your buildings... in rest rooms, cafeterias, offices, corridors, etc., COLOR CONDITIONING imparts an agreeable, efficient atmosphere.

SERVICE! A Du Pont maintenance painting expert is ready to show you, without charge, how COLOR CONDITIONING can benefit your plant... whatever your particular needs may be!

DU PONT COLOR CONDITIONING

steps up production and profits

GREATER employee efficiency, safety, and morale . . . increased rate and quality of production: these are the benefits you get from Du Pont Color Conditioning!

Far more than a "paint job," Color Conditioning is a scientific painting plan that extracts full value from the *correct* use of color . . . *at no extra cost*. Hundreds of industrial plants are proving its worth today . . . in helping employees see better, feel better, work better.

Du Pont Color Conditioning Paints, Safety Color Code and Machinery Enamels . . . specially formulated for every interior surface... assure you longer wear and greater savings in maintenance painting throughout your plant. Mail coupon for full information.

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . .
THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Finishes Division, Dept. F-910
Wilmington 98, Del.

Please send me, without obligation, your 32-page book, "Color Conditioning for Industry."

Name _____

Title _____

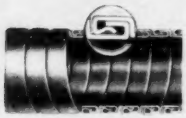
Firm Name _____

Address _____

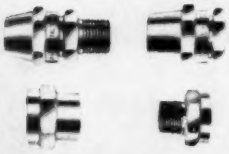
CMH

One dependable source for every flexible metal hose requirement

Corrugated Metal Hose in steel, bronze and stainless steel.



Convoluted Metal Hose in variety of types — steel, bronze and alloys.

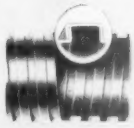


Couplings to meet every need.

CMH	HOSE USE
√	Steam Hose
√	Lubrication Hose
√	Oil Lines
√	Coolant Hose
√	Pneumatic Hose
√	Hydraulic Hose
√	Chemical Hose
√	Insulated Hose
√	Charging Hose
√	Expansion Joints
√	Flexible Connections
√	Exhaust Hose
√	Platen Press Connections
√	Tar and Asphalt Hose
√	Metal Conduits
√	Loading & Unloading Hose
√	Gas & Air Hose
√	Vacuum Hose
√	General Utility Hose
√	Bellows
√	Flexible Lamp Arms

Expansion Joints for high and low pressures — stainless steel and copper.

Bellows in all sizes for all requirements — stainless steel and brass.



Metal Conduits in a variety of types and materials.

Now you can secure all your flexible metal hose needs from a single manufacturer. The handy check list above indicates only the more common types and assemblies manufactured by CMH. Other types and assemblies are also available. Bulletin 102, illustrated at the left, an application guide for CMH Flexible Metal Hose is available on request. Other literature giving full details on expansion joints, bellows and speciality items is also available. Write for your copies of the material in which you are interested and have it available for reference at all times.

Flexon identifies CMH products which have served industry for more than 47 years.

CHICAGO METAL HOSE CORPORATION

Maywood, Illinois

Plants at Maywood, Elgin and Rock Falls, Illinois

In Canada: Canadian Metal Hose Company, Ltd., Brampton, Ontario

You will be amazed at the performance of the REDESIGNED *Cleveland* END MILLS

ILLUSTRATIONS OF VARIOUS NEW STYLE END MILLS—WRITE FOR DESCRIPTIVE BOOKLET

STRONGER! CUT FASTER! CLEAR CHIPS BETTER!

Much Greater Durability and Accuracy!

The new *Cleveland* End Mills are far superior to any you have ever used! They have been completely redesigned to give you strength, speed and accuracy that were never before obtainable! Many months ago we set out to design a different and better end mill. Neither time nor effort was spared in patient development work. We even worked out a new technique for testing the cutting qualities and the stamina of end mills. Users are enthusiastic about the results: Less breakage, many more cuts per grind, consistent accuracy . . . with up to 50% *increase in feed.* For high speed, low cost operation, use the new *Cleveland* End Mills on your next job. Contact our Stockroom nearest you, or . .

Telephone your Industrial Supply Distributor

STRONGER
No sharp corners or points where localization of stresses might occur. Minimum amount of metal has been cut away.

MORE DURABLE
New-style clearance supports the cutting edge; assures against "flaking" or "chipping out."

LONGER LIFE
Radically new flute shape and chip clearing ability reduce wear on the cutting edge, thus maintaining consistent accuracy.

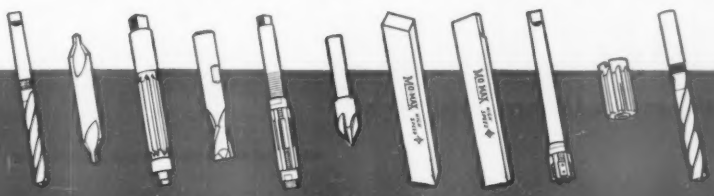
CUT FASTER
New flute shape gives maximum cutting qualities at increased rates of feed.

CLEAR CHIPS BETTER
Redesigned flutes are machine polished. There are no pockets. Chips are free to move.

GREATER ACCURACY
New clearance and accurate machine polish of flutes result in closer control of size.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 11
E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



HERE'S A *GENERAL PURPOSE* STARTER THAT

Beats Corrosion & Dust!

In chemical, liquid fuel, milling, coal handling — any industry faced with corrosive vapors or combustible dust laden atmosphere — Type 371 General Purpose Starters will give unfailing start-stop service, and complete protection! The wall mounted design permits low original cost — economical, space saving installation.

Check these features:

Corrosion Resistant — Aluminum alloy head casting, stainless steel hardware, aluminum painted tank mean corrosion resistant enclosure.

Completely Sealed — Tank is sealed to head with neoprene gasket : . . starter is impervious to dust, corrosive atmospheres.

Weatherproof — Can be used for outdoor installations.

Compact — Small enough to be located conveniently near motor being controlled.

In addition you get *rolling-wiping* contact action . . . low inertia moving parts . . . automatic reset temperature overload relays and other features that add up to minimum oil deterioration, increased contact life! They permit longer use without maintenance. Call your nearby A-C sales representative or write for bulletin 14B7274.

ALLIS-CHALMERS, 1078A SO. 70 ST. MILWAUKEE, WIS.

A-2807

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

"You can control <u>any</u> motor with an Allis-Chalmers motor starter."

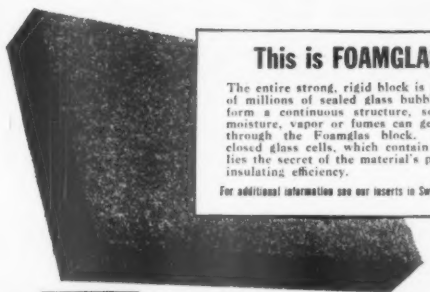
IT'S LIGHT, IT'S RIGID, IT'S STRONG

PC Foamglas . . . the permanent insulation

These husky big blocks of cellular glass are so light that large expanses of roofs in which they are used as insulation need no extra structural reinforcement. So rigid that they readily support their own weight when built into core walls, in which they have also proved their insulating efficiency. So strong that they support more than ordinary loads when used to insulate floors, platforms, etc. in all sorts of industrial construction.

PC Foamglas is an effective aid in maintaining desired temperatures and reducing condensation. It is moisture-proof, fireproof, vaporproof and acidproof. Those are some of the reasons why—when installed according to our specifications and recommendations—PC Foamglas retains its original insulating efficiency permanently.

When next you face the problem of insulating either normal or low temperature areas, be sure you have the latest information on PC Foamglas. You will find it in our current booklets. Just send in the convenient coupon and a sample of PC Foamglas and your free copies will be mailed promptly.



This is FOAMGLAS®

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, moisture, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain still air, lies the secret of the material's permanent insulating efficiency.

For additional information see our inserts in Sweet's Catalogs

Pittsburgh Corning Corporation
Dept. H-109, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation, a sample of PC Foamglas and your FREE booklets on the use of PC Foamglas Insulation as checked below:

Normal Temperature: Roofs ☐ Walls ☐
Floors ☐ Refrigerated Structures: ☐

Name_____

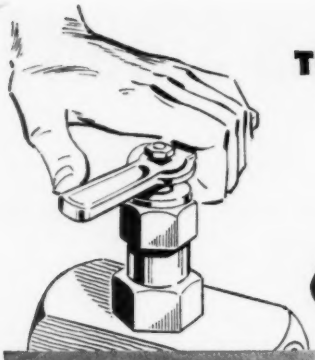
Address_____

City_____ State_____

PITTSBURGH PC CORNING

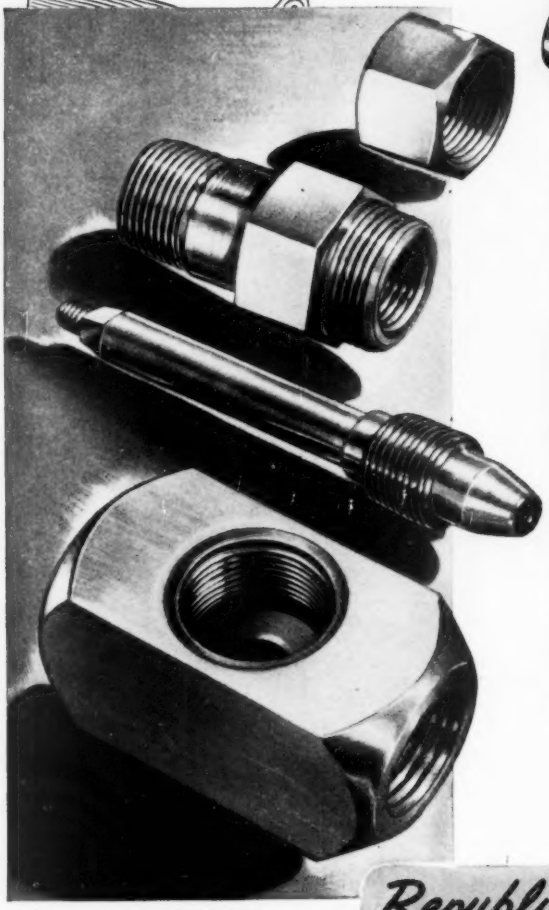
FOAMGLAS INSULATION

. . . when you insulate with FOAMGLAS . . . you insulate for good!



TURN OFF HIGH MACHINING COSTS...

with Free-Machining *Enduro* Stainless Steel



The uniformly high machinability of Free-Machining ENDURO Stainless Steel does it for you . . . fast. Yet, that is only one of many qualities which enable you to keep product cost down and product quality up.

In these acid valve parts, for example, close tolerances, accuracy of section, uniform soundness and fine surface finish, resulting from the advanced Union Drawn process of cold drawing, all contribute toward production economy. And ENDURO's unsurpassed corrosion-resistance affords pre-determined assurance of trouble-free valve life, despite rigorous, corrosive operating conditions.

Whenever stainless steel enters your machined parts picture, remember that it pays to specify Free-Machining ENDURO Cold Finished Bars. They, as well as hot rolled bars and wire, are available for immediate delivery. Write today for specific information and prices.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Bldg., New York 17, New York

YOU, TOO, CAN BE AN EXPERT ON "PROFITS"
Wouldn't you like to have clear, concise answers to the many questions you may be asked on this all-important subject? We have them for you—in an interesting, colorful booklet written by Phelps Adams of The New York Sun. Write us for a copy.

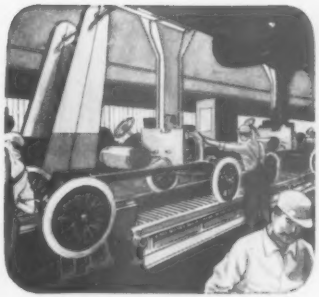
Republic ENDURO
FREE-MACHINING
STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

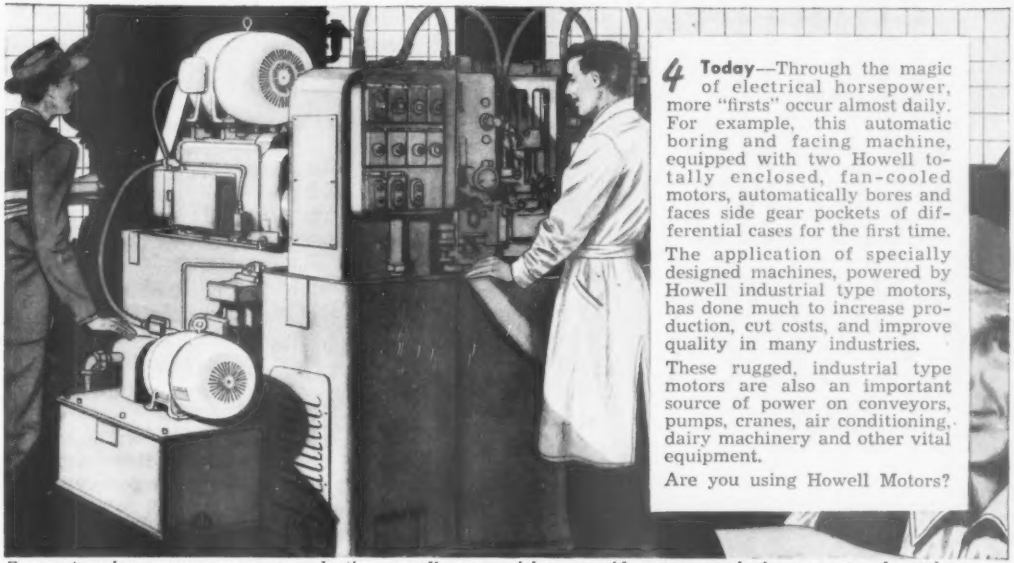
1 **1875**—Wisconsin offered a $10,000 reward to the person who would invent a steam carriage. George Seldon, Rochester, N. Y., was first and collected . . . America's great auto industry was under way.

2 **1892**—First gasoline-driven car was built by Charles Duryea with screw drivers and wrenches. Machine tools to aid this growing industry soon appeared. But parts still had to be assembled by hand.



3 **1913**—First moving assembly line was used in auto plants! Gone, now, was much of the labor of carrying parts. In 1915, Howell "Red Band" Motors appeared and soon were widely accepted in industry.

FAMOUS AUTOMOTIVE FIRSTS! REMEMBER?



4 **Today**—Through the magic of electrical horsepower, more "firsts" occur almost daily. For example, this automatic boring and facing machine, equipped with two Howell totally enclosed, fan-cooled motors, automatically bores and faces side gear pockets of differential cases for the first time.

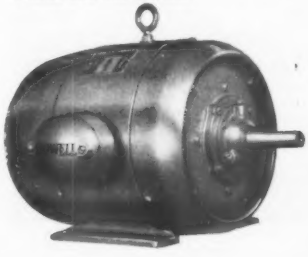
The application of specially designed machines, powered by Howell industrial type motors, has done much to increase production, cut costs, and improve quality in many industries.

These rugged, industrial type motors are also an important source of power on conveyors, pumps, cranes, air conditioning, dairy machinery and other vital equipment.

Are you using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed, fan-cooled motor—windings completely sealed against dirt and weather.



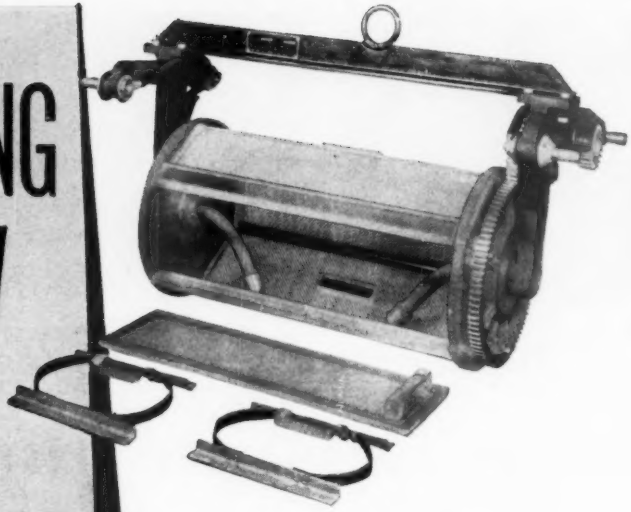
HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

ANNOUNCING THE NEW UDYLITE LUCITE PLATING CYLINDER



- **UP TO 180°F. UNDER LOAD!**
- **30% INCREASE IN PERFORATED AREA!**
- **"DEEP-DIP" DESIGN!**
- **OPERATES THROUGH COMPLETE CYCLE! (Acid or Alkaline)**

Rigorously Tested Under All Conditions In The Industry's Finest Testing Laboratories

We've really put this new cylinder through the paces—subjected it to operating temperatures of 180° F. *UNDER LOAD*—heaped it full of odd-shaped parts for abrasion tests—made it PROVE it's fit to take its place with the other top-quality Udylite equipment the industry knows so well. *And now it's ready for you.*

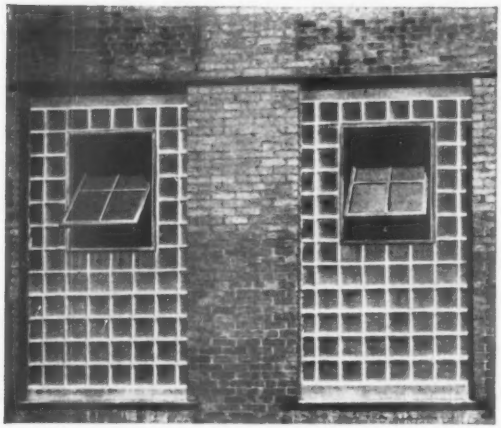
Notice these important features: Door clamps are designed to give maximum support to the door panel, yet open easily. Door openings are machined all around to insure positive fit. The shell is grooved and cemented into the cylinder heads. Over-size superstructure—"Deep-Dip" design—lets the cylinder hang deep in the tank. We've given it 30% more perforated area than conventional cylinders—and a full 14″ *inside* diameter—for faster plating and greater capacity.

Ask your local Udylite Technical Man for further details without delay—or write us direct:

PIONEER OF
A BETTER WAY
IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICH.

Exterior view before replacement of window sash with Insulux Glass Block.



Exterior view after Insulux fenestration. Insulux is easily maintained, insulates better than windows, gives "controlled daylight."

It's profitable to modernize with Insulux

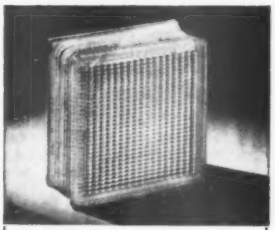
because–

1 Insulux Glass Block means low-cost maintenance since it does not require painting, is easy to keep clean—and does not rot, rust or corrode.

2 Heating costs are lowered. Insulux Glass Block has high insulation value—this means more uniform temperature control, less condensation during cold weather, lower fuel bills.

3 Insulux reduces infiltration to a minimum, helps keep plant air dust-free and eases the job of humidity control.

These are but a few of the many reasons Insulux Glass Block is the outstanding form of daylighting for factories. Ask your local Insulux dealer, or send coupon below for complete information about many successful Insulux applications—the free booklet "Daylight in Industrial Buildings" is illustrated with hundreds of pictures of interest to you.



INSULUX
GLASS BLOCK ®
AMERICAN STRUCTURAL PRODUCTS COMPANY
Subsidiary of
OWENS-ILLINOIS GLASS COMPANY

MAIL COUPON TODAY

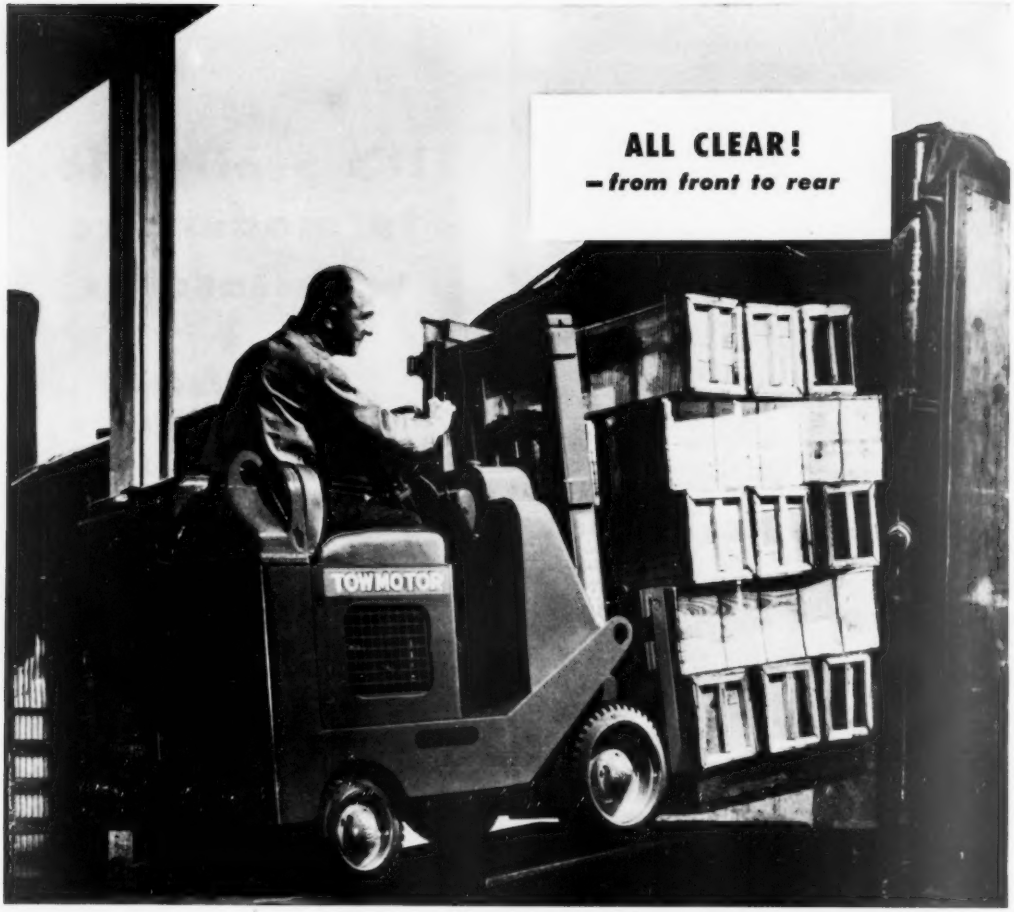
AMERICAN STRUCTURAL PRODUCTS COMPANY
Dept. F-30, P.O. Box 1035
Toledo 1, Ohio

Please send me your free 36-page, fully illustrated booklet "Daylight in Industrial Buildings."

Name _____

Address _____

City _____ *County* _____ *State* _____



every handling job is <u>easier</u> with TOWMOTOR MH!

NO HANG-UP ON "HUMPS"

—another Towmotor efficiency feature

Towmotor provides plenty of under-clearance to avoid "hanging up" on the steepest ramps or roughest, bumpiest surfaces. Move loads where you please —with safety!

With ample under-clearance ranging from 5" to 10½", Towmotor's complete line of fork lift trucks assures "all clear" performance on difficult handling jobs. This safe under-clearance at center prevents any danger of scraping on ramps, high door sills, railroad tracks or other obstacles. That's just another reason why sturdy, agile Towmotors get the job done in less time, at less cost. Compare Towmotor with any other lift truck and you will see why Towmotor's practical features make every **M**ass **H**andling job easier, faster, safer. 10 models plus standard and specially designed accessories handle loads from 1500 to 15,000 lbs.—a Towmotor for every job. Write for a copy of the "Operators Guide." Towmotor Corporation, Division 5, 1226 E. 152nd St., Cleveland 10, Ohio. Representatives in all Principal Cities in the U. S. and Canada.

TOWMOTOR
THE ONE-MAN-GANG

FORK LIFT TRUCKS and TRACTORS

R E C E I V I N G • P R O C E S S I N G • S T O R A G E • D I S T R I B U T I O N

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

NOW...

LIFE-LINE

slashes

a-c motor upkeep costs

Here's how Life-Line motors can save you half the upkeep cost, and more.

A recent survey of 114 large motor users—operating 131,626 a-c motors of 1 to 50 hp—shows how much motors *really* cost when you figure actual "Life Cost".

The survey shows that the yearly average cost of periodically lubricated motors was $270 for every hundred motors installed.

On lubrication cost alone, Life-Line motors saved this $270. That's because Life-Line requires no periodic lubrication—no added lubrication of any kind.

The survey also indicates that the yearly outage cost per hundred motors, for repairs and lost machine and man-hours, was $960.

The record of 500,000 Life-Line motors in service, to date, indicates a failure rate averaging less than half that of conventional motors covered by this survey. This means over 50% indicated reduction in motor outage costs—in short, a possible saving of $480 per year with Life-Line.

Add these savings—$270 for lubrication plus $480 for outages—and the result is $750 per hundred motors per year.

Can you afford to pass up savings like these? Get the facts on the savings possible in your plant. Ask your nearby Westinghouse representative for a copy of B-4321 "How to Cut Motor Costs $750". Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21514

Westinghouse *Life-Line* Motors

Down time due to FOUL AIR adds more to your costs...

. . . than the blower that helps men do a fair day's work

Speed fresh, cool air into a furnace, manhole, tank or other confined area where men must work and you'll get faster, better work in return.

There's a portable, easily adaptable Coppus Blower or Exhauster for just about any problem caused by stagnant, hot or fume-filled air. The Blue Ribbon stands for precision engineering that assures peak performance at lowest cost. Check and mail the coupon today for the information that fits your particular problem. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER COPPUS "BLUE RIBBON" PRODUCTS

HORIZONTAL TURBINE
Six frame sizes —
1 to 150 horsepower

VERTICAL TURBINE
Six frame sizes —
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp., 110 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

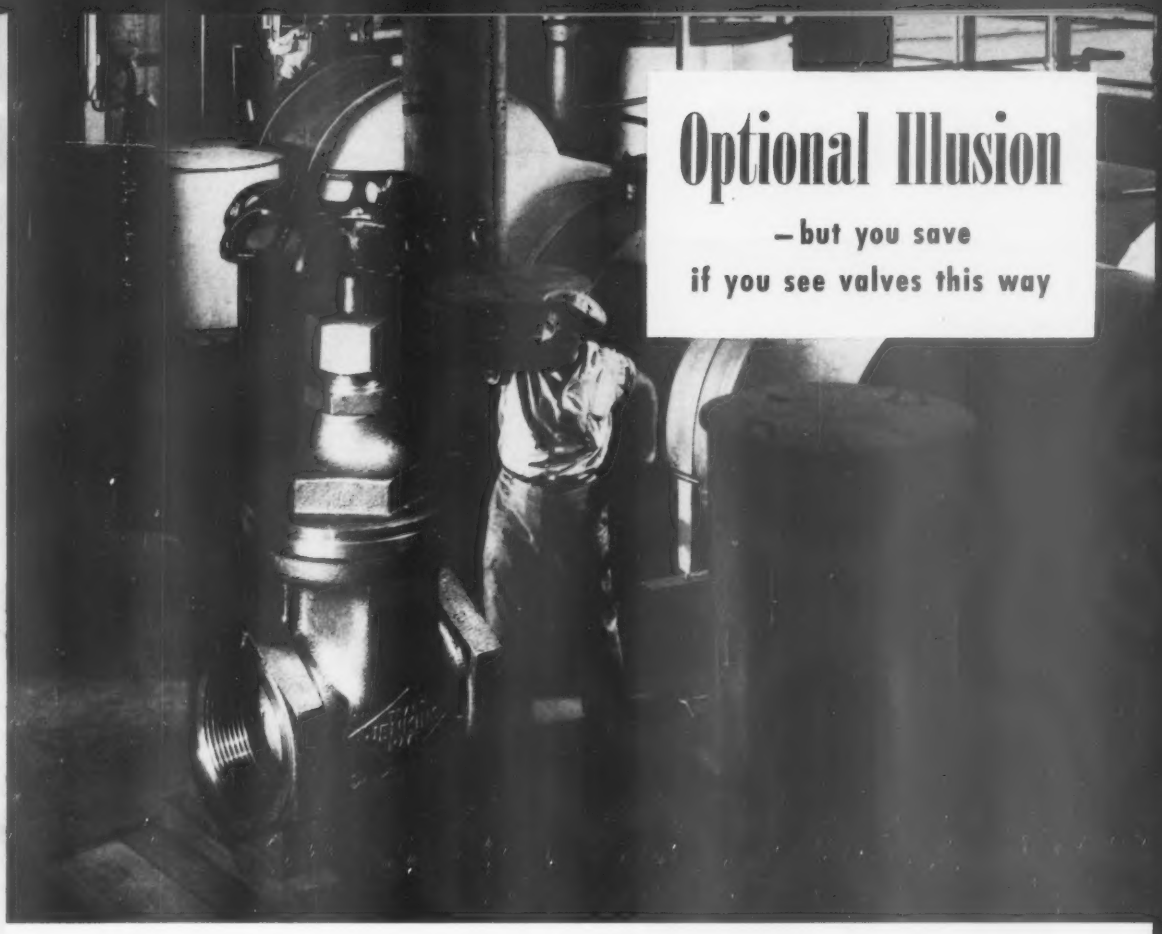
NAME .....

COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)



Optional Illusion

– but you save if you see valves this way

THERE ARE TWO WAYS of regarding the valves in your plant. You can think of the relatively small cost of a single valve, and dismiss them as a minor, "petty cash" investment. Or, you can think of *all* valves in your plant as *one* valve, as pictured, by photo-magic, in this pharmaceutical plant. and see them in proper perspective.

YOU'LL FIND IT PAYS to take the latter view, for in *any* plant, *any* building where fluid control is involved, valves, collectively, are as important, in terms of investment and operating expense, as larger plant units, and should be selected with the same sharp eye to quality and economy.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but multiplied by thousands, it is a serious drain on operating budgets. JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering for lowest valve costs in the long run. *Sold through leading Industrial Distributors.*

•

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

"PRACTICAL PIPING LAYOUTS" is a 32-page book containing diagrams and descriptions of 25 basic piping layouts with complete recommendations for valve selection and location in the lines. Tells you "which valve where for best performance". FREE on request. Write JENKINS BROS., 80 White Street, New York 13, N. Y.

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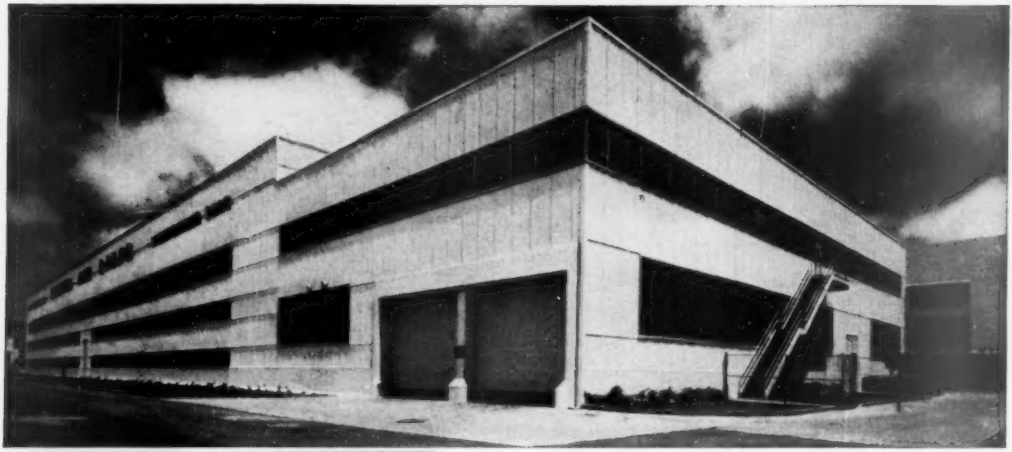

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New United Airlines maintenance base can overhaul 11 big planes simultaneously. But there'll be no maintenance needed for the exterior walls of this huge new building! . . . They're Corrugated Transite.

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Moreover, they provide *functional decoration* as well as structural utility.

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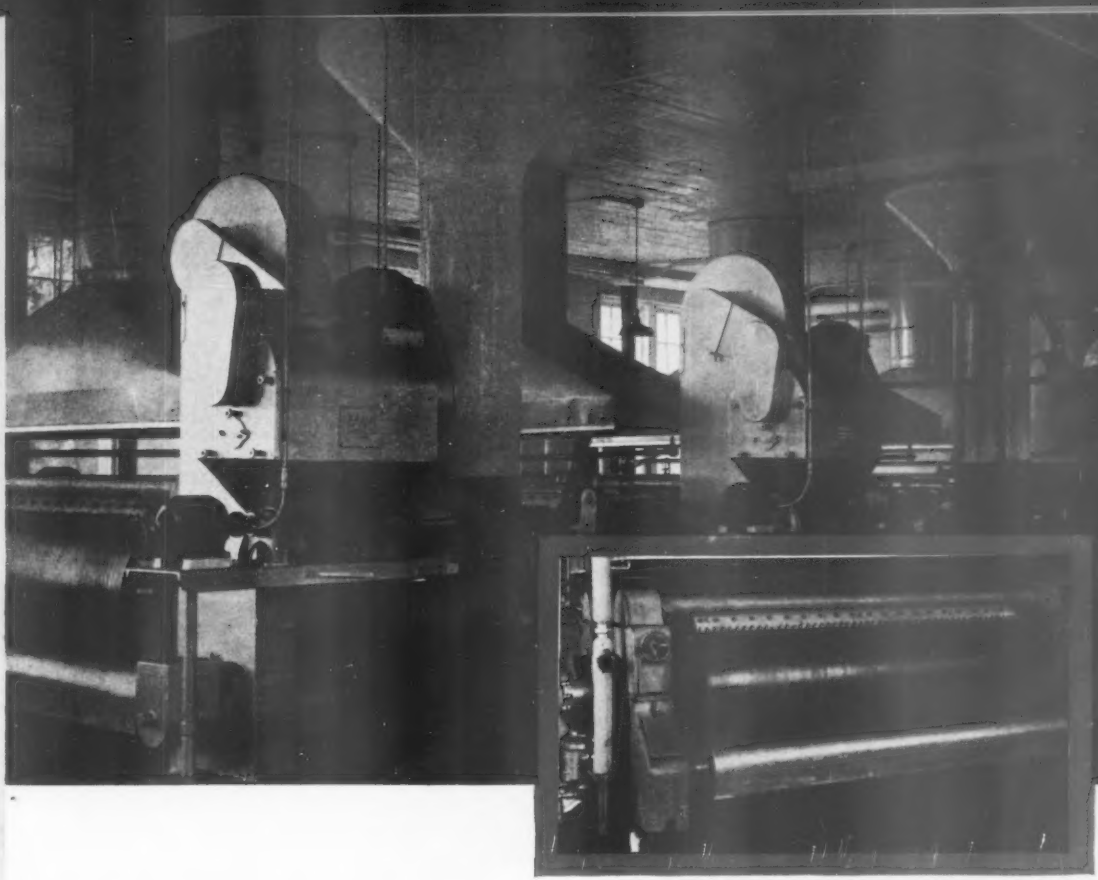

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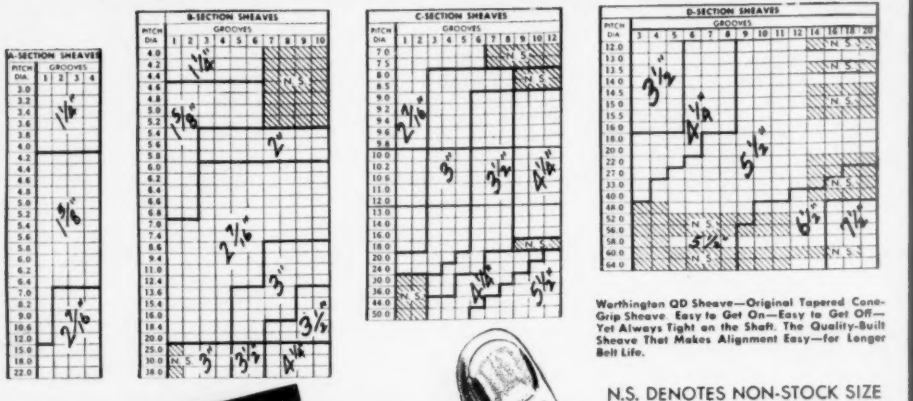

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Specify Worthington Multi-V-Drives, with QD Sheaves and Worthington-Goodyear EC Cord V-belts. (Goodyear EC Cord or Steel Cable V-belts are used exclusively in Worthington Multi-V Drives.)

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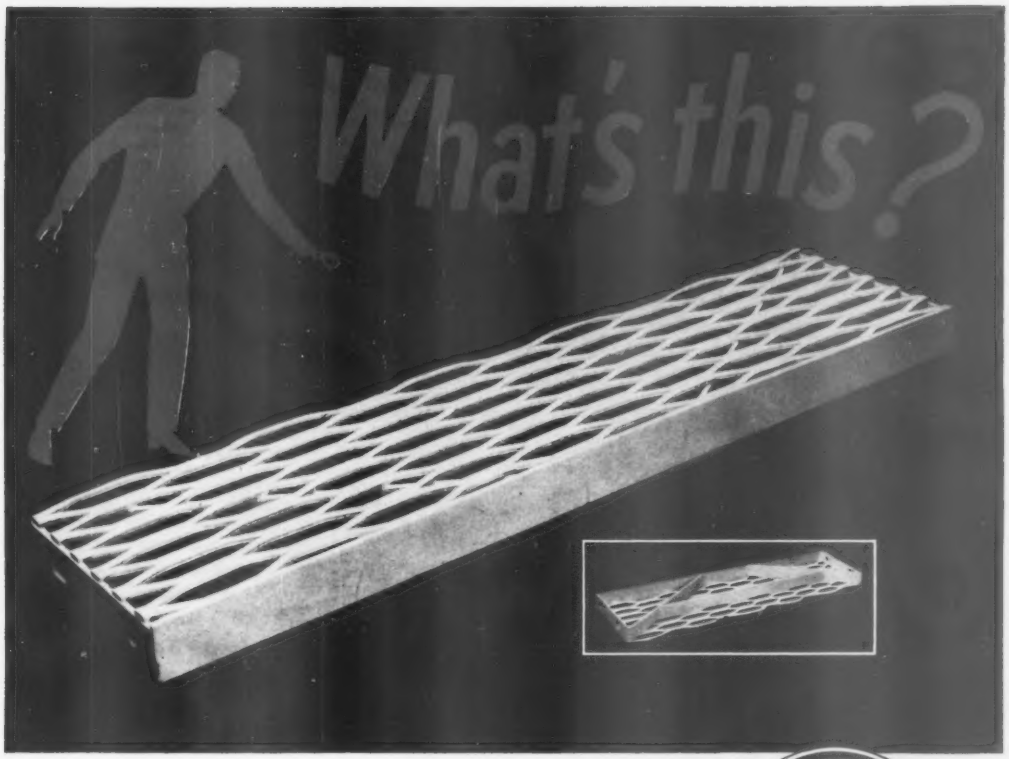

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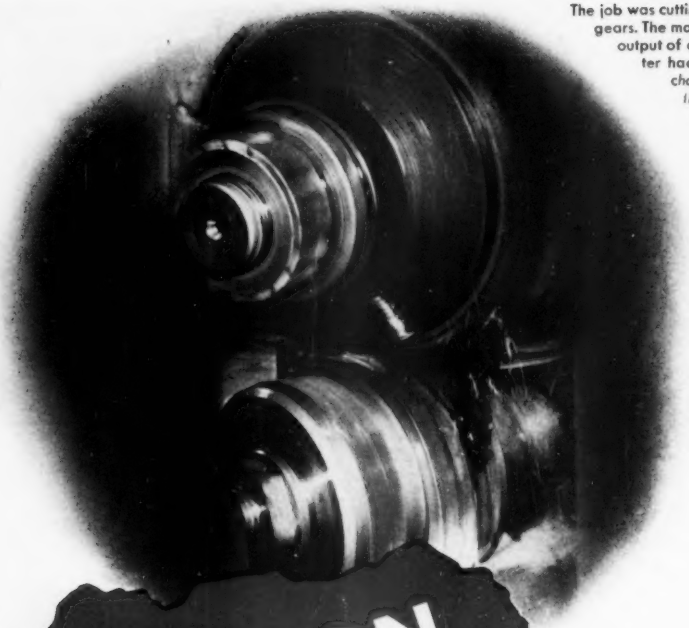

The job was cutting automotive transmission gears. The manufacturer* was getting an output of only 504 gears before cutter had to be scrapped. *Then he changed to Texaco Sultex Cutting Oil.* Output immediately jumped to 1017 gears per cutter life. *Production more than doubled, tool cost cut in half!*

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MUDDLING in High Places

It is time for men in Washington and London to stop toying with the problem of international trade. We of the democratic West are at a turning point in our economic affairs. A false step by either the United States or Britain could lead quickly to disintegration of trading between the people of the world as we have known it for the past hundred years. Recent meetings of diplomats in London and Washington have not lifted us out of this danger.

By two simple tests you and I can measure the sincerity of the men in Washington and in London who are trying to solve what they call "the dollar crisis."

One test applies to the British: Is Britain making an honest effort to re-establish itself as a real competitor in world markets?

The other test applies to us in the United States: Are we willing to see Britain re-emerge as a strong competitor in world markets—even in our own home market—and to help her do so?

Today, even though both countries have faced the devaluation test, the answer to these questions probably is no.

I

The situation we face is, in fact, unprecedented. In every important industrial country of the non-Communist world, except Germany and Japan, production is above prewar volume, thanks largely to the Marshall Plan. Yet trade between nations is shackled as it has never been since the 18th century. And the shackles grow day by day. What is worse, two distinct trading areas—the dollar area and the sterling area—have grown up in the non-Communist world, and the gulf between them grows wider.

What kind of leadership have the United States and Britain had in the face of this crisis? President Truman late in August wisely checked the trans-Atlantic bickering over the dollar crisis. *But Mr. Truman showed no awareness of the basic question that the American people must soon decide: Is the United States able and willing to generate trade between nations, as Britain did in the 19th century?*

What have British leaders offered us? Foreign Secretary Bevin and Chancellor Cripps called their September visit to Washington "one of the most important missions in history." *But they did not tell the British people, and perhaps do not admit themselves, that their Labor government must change its internal and external policies if Britain is ever to earn its living in a competitive world.*

Admittedly, the problem Britain has faced since 1945 is a colossal one. But, in the face of its grave difficulties, what has Britain done? The working day was shortened. Welfare economics have run riot. High taxes have sapped incentives. Labor and capital have clung to their prewar psychology of cartels and featherbedding. Government controls and government trading have hamstrung private initiative. Nationalization schemes have injected politics into the struggle for industrial recovery.

Thus the policies of the Labor government have made Britain's adjustment to its new position in the world immensely more difficult. But Americans who attribute the danger of an international breakdown to British socialism greatly oversimplify the problem. Virtually every country in the world, socialist or not, faces the same dollar crisis that Britain faces.

continued on next page

We Americans must recognize that our economic strength unbalances world trade as does Britain's weakness. World War II increased America's superior power to produce goods. It also made the United States more self-sufficient. Thus, while the world demand for American goods has risen, our demand for foreign goods, except for basic raw materials, has not increased. Today we sell more to every major area of the world than we buy from it – and yet we wonder why there is a dollar crisis.

It is time for us to recognize that there are two fundamentally conflicting pressures at work in the United States. One is our desire for a big surplus of exports over imports. The other is our desire for a system of free-wheeling trade around the world. We can not have both unless we as taxpayers wish to subsidize our exports. Which do we want?

Curtis E. Calder, chairman of the International Relations Committee of the National Association of Manufacturers, says, "The battle of the foreign trade gap is essentially that of reconciling our urge to export our surpluses with a reluctance to accept imports in payment for them . . . The dilemma is an uncomfortable one to face."

II

Here, then, are the basic questions that confront men in Washington and London. Does Britain really want expanding world trade or a high-cost welfare state? Does the United States really want expanding world trade or a huge surplus of exports? So far politicians in Washington and especially in London have ducked these issues because they are political dynamite.

If the people of Britain decide they want to regain their position as a competitive trader in expanding world markets, here are specific objectives that men in London should set for themselves:

1. Lower government costs. The British Treasury has asked for cuts of 5% in 1950. But a cut nearer 15% will be necessary, even if that means fewer government subsidies and health services. Enterprise will never revive nor costs come down while taxes take 40% of the British national income, including roughly 60% of business profits.

2. Fewer government controls. Only by removing controls and allocations (except on a few necessities) can Britain begin to return to prices fixed by competition rather than by government fiat.

3. Stronger anti-monopoly legislation for both business and labor. Britain needs a concerted drive against all forms of restrictive, high-cost practices. This drive should put teeth in the anti-monopoly act and supplement it with legislation to end restrictions imposed by trade unions.

4. Less restrictive trading practices. Britain should retreat gradually from its international barter between governments if competition is ever to have free play in international trade.

Meanwhile, if we of the United States sincerely want multilateral world trade, men in Washington must face up to four problems and hammer out workable solutions:

1. Use of the International Monetary Fund to back a devalued pound. In time the Fund, in which we have the controlling voice, might be used to promote convertibility of pounds into dollars.

2. Help for Britain in meeting war-created external debts. This might mean support for London in getting a reduction of the war debts Britain owes India, Pakistan and Egypt, for example. To achieve such a debt reduction for Britain we might have to underwrite a part of a Southeast Asia recovery program.

3. Encouragement of American investments abroad. Such investments should be directed primarily into enterprises which will earn dollars, such as the development of new sources of raw materials, or which will raise productivity abroad.

4. Our own tariff barriers. Our attitude toward this critical issue will be the acid test of how deeply we believe in the merits of free world competition.

If we really want free, competitive trading between the people of the world, these issues must be met and resolved by leaders on both sides of the Atlantic. If we do not want to face these issues, then let us resign ourselves to a world walled off into three trading areas: the Communist bloc, the sterling area, and the dollar area. So far, Washington and London have muddled along, except in facing the devaluation problem. Clarity and courage are still needed.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

DAVID L. COLE SAYS: "The course of collective bargaining has been changed"

"Far too many (disputes) are concluded by the intercession of third parties . . . Such techniques *conclude* the disputes, but do not truly *settle* them"

"Ability or inability to pay *is* an important factor in wage negotiations"

• What does the steel fact-finding report really mean?

That a pattern is likely to be set for bargaining over pensions and social insurance? That you are going to have the fight of your life on your hands over the "employer-pay-all" principle?

Yes, of course the report means this.

But this is only the *short-term* implication of the Steel Board's report.

As David L. Cole points out, these short-term implications *are not the most important* lessons that the steel dispute and others like it have to teach us.

Our big problem is this: *Collective bargaining is breaking down.*

What the Steel Dispute Means to You

by DAVID L. COLE

Member, President Truman's Steel Industry Board

THE COURSE OF COLLECTIVE BARGAINING has been changed. In its report to the President, the Steel Industry Board called attention to this fact. We said:

"The failure to recognize this is leading to frictions and misunderstandings which often make the problems more difficult. The parties become confused, and feel justifiably aggrieved. This, in turn, tends to create an atmosphere in which solutions become more elusive and cooperation less likely."

Specifically, we pointed out that in many steel plants the management and the union do not work

out agreements around the collective bargaining table. Instead, they simply wait to see what U. S. Steel does and then automatically put similar provisions into their agreements.

"This practice," we said, "is clearly a variation from the accepted concept of collective bargaining as defined in the statutes and interpretations; it tends to promote a feeling of dissatisfaction and disharmony between the parties which makes cooperation difficult."

There is clearly a need for a better understanding among the parties as to what they should bargain about – a problem to which the interpretations of the law merely add confusion at the present time.

In addition, there are numerous problems of method and attitude that must be solved if the parties are to approach collective bargaining in a spirit conducive to reaching an understanding and building goodwill.

What Must or Should Be Bargained?

Collective bargaining was not defined in the Wagner Act – or in the Taft-Hartley Act. In substance, the present law simply makes it an unfair labor practice to refuse to bargain with the representatives of the employees on rates of pay, wages, hours of employment, or other conditions of employment. The National Labor Relations Board has interpreted this to mean:

Employers must bargain at any time with the duly accredited union on any matter that falls within the outline of wages, hours, or other conditions of employment – unless *the subject in question is already expressly mentioned in the labor agreement.*

Relying on the several interpretations of the NLRB, the Steel Industry Board found that pensions *were* bargainable. We reached this conclusion despite the fact that the reopening clauses in the steel contracts did not provide for consideration of pensions. *Our reasoning was simply that the subject of pensions was not mentioned in the existing contracts.*

A number of recent NLRB cases support this conclusion – particularly the Inland Steel, Allied Mills, and Tidewater Oil cases.

We did not approve of these interpretations. We simply applied them to the facts before us.

Some careful students of collective bargaining are critical of such NLRB interpretations. George W. Taylor, for example, feels that the matters to be negotiated – certainly those beyond the group commonly accepted as of concern to unions – should be left for determination by the parties themselves, and not by government regulations.

There is merit in Taylor's argument. An agreement for a definite term ordinarily represents the granting of certain requests and the rejection of others. It is reasonable to expect that contract stability would bar the union from insisting shortly thereafter – perhaps even the next day – that it be permitted to renew its demand for one of the benefits it has just agreed to forego.

One of the spokesmen for a steel company argued this point before the Steel Board. If the NLRB rulings are followed strictly, he said, an employer will be able to protect himself against continual demands during the term of a contract only by annexing an encyclopedia to it. The contract would stipulate in writing that all matters mentioned in the encyclopedia are expressly barred from further consideration until the current contract expires.

When the parties have reached an agreement which they believe settles their rights for a specified period of time, it is easy to understand how irritating it can be to find that there *is* no such settlement. In fact, the employer may find that he must be prepared to resume negotiations on matters not raised in the original negotiations (or raised and dropped), *so long as they have not been written into the agreement.*

This situation is anything but helpful to the cause of good labor relations. Nor is it necessary as a practical matter.

If the contract is to be subject to change or enlargement before it runs out, this fact should be agreed upon and the details spelled out in the reopening clause.

Both sides would then know their rights and obligations for the period indicated. Both would then know that the only changes permitted would cover such matters as they have agreed upon.

Industry-Wide and Pattern Bargaining

A more serious cause of dissension is the changed framework into which collective bargaining has been made to fit.

It was intended that the Wagner Act would simply require the employer to recognize the duly chosen agents of his workers and negotiate with them. It was not intended that government would go into the conference room to supervise the

manner or subjects of the conference – except as necessary to protect the rights of workers under the Act.

The *collective* feature of the bargaining that the law sought to protect was on the side of the workers. It was hardly thought necessary to provide procedures for the choice of the employer's representatives.

But what has happened?

In steel, the game of "follow the leader" is being played. Individual plant bargaining on major matters is perfunctory. In other situations in which industry-wide bargaining is practiced – like coal mining, railroads, and the needle trades – we have collective bargaining on *both* sides, with trade associations or elected committees speaking for groups of employers. Technically, this may be called "*collective* collective bargaining."

It does not follow that industry-wide bargaining is undesirable. The framers of the Taft-Hartley Law, after much debate, intentionally refrained from declaring it bad. And there is much evidence that with reasonable safeguards it is found desirable by large segments of industry.

In several other respects the area of bargaining is also being confined within constantly narrowing limits. Minimum wage and overtime penalties are now provided by the Fair Labor Standards Act, the Walsh-Healey Act, and by state laws.

The standards set by other industries, or by others in the same industry or labor market area, are being applied as patterns to be followed.

Many of these developments are the result of good economic and business reasons. But the scope of collective bargaining is nevertheless being narrowed.

The point is this: After labor organizations attain standing and security, the kind of collective bargaining contemplated by the sponsors of the Wagner Act loses its meaning.

Problem of the Small Employer

Some of these changes in bargaining have been gradual, have been absorbed, and are not causing any friction. But some of them, tacitly accepted for a while, are potential sources of trouble as business conditions change.

Smaller employers who were content to forego separate bargaining, and who simply followed the patterns set by industry leaders during the years of relative prosperity and labor shortage, are now beginning to complain. They argue that they are being ignored; their individual problems and needs are not being taken into account by their workers when labor costs are under discussion.

Whether it will be possible to change the course followed for years is a difficult question. Some employers frankly admit that tradition will make it impossible for them to operate with lower wage rates than the industry pacesetters. But they feel that at least they should be *heard* before the rates of the industry leaders are set. They feel that the industry rate should be measured by *their* financial ability and not by that of the larger, more prosperous enterprises.

In any event, they are extremely unhappy because they regard themselves as ignored by the labor organization which continues to set the standards through negotiation with the leaders. This, say these smaller firms, is not the collective bargaining which the law intended.

There is a real basis for this feeling of the smaller employers. This makes it harder to attain a cooperative spirit in labor relations.

Ability or Inability to Pay

It is easy to appreciate management's desire to prevent competitors from having the advantage of lower wage rates or labor costs through more favorable contracts. In my experience as a mediator and before that as an attorney for employers, I heard this point made many times by management. In fact, "most favored nation" clauses are often put into agreements; these either bar the union from lower rates elsewhere, or give the original management the benefits of such lower rates.

Likewise, it is not hard to understand why labor insists that it should not be expected to sell its services for less to one employer than to another. The reasoning is that this is no fairer than to ask a public utility to sell its services for less to an unsuccessful firm than to a prosperous one. Unions do not want to "subsidize" inefficient operations by accepting anything less than established wage rates.

Despite these points, ability or inability to pay *is* an important factor in wage determinations, whether made directly by the parties, by arbitrators, or by others. Employers are inclined to be liberal or unbending in negotiations as their financial circumstances dictate. Contrariwise, workers are demanding or content to remain at current wage levels, depending on the state of business.

Continued on next page

How Can Collective Bargaining Be Improved?

I believe that management's current dissatisfaction with pattern and industry-wide bargaining is due to general dissatisfaction with the way in which collective bargaining as a whole is working – not so much to conviction that it is getting unfair treatment.

Far too many disputes remain unresolved after discussion across the bargaining table. Too many are concluded by the coercion of strikes and layoffs, or by threats of strikes and layoffs.

Far too many are concluded by the intercession of third parties – either government bodies or privately selected arbitrators.

Such techniques *conclude* the disputes, but do not truly *settle* them. Without denying the good that has been done by collective bargaining, it is fair to say that more was expected of this process than has been realized.

What can be done about it?

First, the legal rights and obligations of the parties in the light of present circumstances should be made clearer. That will help to eliminate the confusions that tend to create disharmony between labor and management.

Second, the art of collective bargaining must be practiced better than it has been. Simply assuming that representatives of both sides face each other across the bargaining table does not assure good or successful collective bargaining.

John L. Lewis pointed out to the Board of Inquiry in the 1948 bituminous coal case that courts could compel him by injunction to meet with certain industry people. But they could not dictate his behavior at the bargaining table, or the way he should conduct himself in the market place. The coal operators ruefully conceded this was true. And they joined in the conclusion that fruitful voluntary bargaining could be conducted better without compulsion on either side.

Why do some employers get along with their workers and unions so much better than others?

It is mainly because they know that effective bargaining is possible only if the approach is reasonable and well-mannered. As in other human relations, the behavior of one party is largely prompted by the behavior of the other.

Perhaps the response will not be immediate. But if one listens attentively to the other, admits the soundness of things that are sound, and tries earnestly to understand the viewpoint of the other, it is inevitable that similar attitudes will grow on the other side. In the long run, collective bargaining will really function only when such an approach is made to it.

What About Fact-Finding Boards?

The several ways in which fact-finding boards promote and supplement collective bargaining were outlined in detail in the report we made to the President. We were careful to point out, however, that:

"These comments are not to be taken as an indication that we favor establishing wages and other conditions of employment by government or even by the recommendations of fact-finding boards in preference to direct agreement of the parties. Quite the contrary, the most preferable agreement by far is that which the parties themselves make...

"After all voluntary efforts to reach an agreement have failed, including the inability to agree on arbitration, no machinery more effective than fact-finding boards with power to recommend has as yet been suggested."

Fact-finding has been a valuable technique in the past, when properly used. It serves to provide a cooling-off period. The parties hear fully from each other, sometimes for the first time, a dispassionate statement of reasons why they hold their respective positions. The board is also enabled to inform the public intelligently of the details of the dispute and of its judgment as to a fair basis of settlement. An informed public opinion is an extremely important factor in collective bargaining.

Regardless of the outcome of any specific case – including the steel case – fact-finding will continue to be a valuable technique.

PENSIONS: WHAT DOES THE WORKER SAY?

Contributory or non-contributory? That's the big pension battleground. The unions and the President's steel fact-finding board say: "Non-contributory. The employer must pay all."

What does the worker say? **FACTORY has just asked him in its sixth annual survey of worker opinion** **(see page 98)****.**

The worker does not agree with the fact-finding board or with Philip Murray and other union leaders.

Two out of three workers (65%) state they should share pension costs on at least a 50-50 basis with their employers. Only one in four (24%) believes the employer should pay all.

FACTORY
MANAGEMENT AND MAINTENANCE

L. C. MORROW and HARRY LEE WADDELL, Editors

What Is Wrong With The Purchasing Power Theory

THAT WE CAN MAINTAIN our existing standards of living by maintaining the purchasing power of workers is an attractive theory. In essence it says that costs of production and prices of products mean nothing; that paying out more money to workers to meet the higher prices will fix everything up.

The purchasing power philosophy really goes further than that. It condones paying increasingly more wages and salaries for less work. From there it is only a step to paying for no work at all, which even now is recommended to some extent.

If what is paid in wages and salaries were nothing but money, and money had the real value that it seems to have, the thing would work. But what actually is paid is work itself. It's a roundabout process, to be sure, but the molder, for example, swaps his work in making castings for the work of the home builders, the clothing makers, the farmers and canners, the automobile makers, and others.

If he does right by his family, he swaps his work first for food, clothing, and shelter. Out of what is left he saves some, and spends the remainder for things to make life more enjoyable. His tastes may dictate spending for the theater, for travel, for television, or for any one or some combination of a hundred attractions that are competing for his favor—that is, want him to work for them.

What a man saves is really work—not silver, gold, or paper money. He banks his extra effort—that part of his work which he doesn't have to spend for food, clothing, and shelter; and which he doesn't choose to spend for items of comfort.

So the purchasing power theory should mean something other than it does. It should mean that each one of us ought to work to produce more, so that some of his effort can be put into the bank, and some traded for extra comfort.

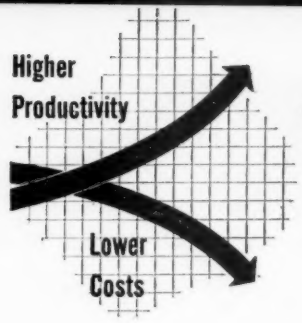
More Work, Better Living

If everyone did just that, the value of the extra efforts would be compounded. The extra efforts would bring about greater total output, which would mean lower producing costs. Because prices are controlled by competition, the lower costs would force prices down. So the individual not only would have more work in the bank with which to buy things; he could buy more of them.

There is undoubted value to the purchasing power theory, if it is guided in the right direction. Certainly if the abilty of everyone to buy is kept at a high level, buying will take place, and the things that are bought will have to be made. But the purchasing power cannot be created except by doing the work. Pay in advance will destroy incentive, the work will never get done, and we'll all be living on work we haven't performed—an impossibility on a national scale if we want to do anything except dub along.

L C Morrow

THE SIXTH



ARTICLE IN FACTORY'S

Provide Favorable

A timely discussion of the physical aspects of factory environment that promote high productivity . . . *lighting, color painting, air conditioning, noise reduction and vibration control, plant architecture and landscaping.* Why favorable working conditions invariably pay off in greater worker efficiency and lower unit cost . . . how you can improve working conditions in your own plant

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THE FACTORY ENVIRONMENT in which your employees work is made up of seeming trifles. But they really are tremendous trifles. For these trifles affect your production and your costs.

If the factory environment does not encourage good work, production per worker declines and cost per unit goes up. But—if employees have the advantage of favorable working conditions, *worker efficiency increases and unit costs go down.*

There should be no need to stress the importance of cutting costs under present economic conditions. So it is timely to inquire into those working conditions that promote high productivity.

This article will deal with the physical aspects of the factory environment in which employees perform their labor. Next month's article will discuss the facilities provided by the company for its employees' health, safety, and convenience.

The elements of the physical environment that most affect the productivity and satisfaction of industrial workers are *lighting, color painting, air conditioning, noise conditioning and vibration control, plant architecture and landscaping.*

Obviously these elements vary in importance from industry to industry, and some even from department to department. But, regardless of the varying proportions, each of them has a positive influence on worker productivity and satisfaction. These influences will first be discussed and later demonstrated by actual case studies.

GOOD LIGHTING—a must in every plant

Over the past quarter of a century, our knowledge of industrial lighting has been greatly expanded. The filament lamps of 30 years ago have been much improved. Two new types of lamp—mercury vapor and fluorescent—have come into wide use.

Regardless of which of these light sources is used, let us examine the factors that make for efficient lighting in industry. And how do those factors contribute to worker productivity and satisfaction?

Lighting intensity. The first and most important element of good lighting is intensity, as measured in foot-candles. The general lighting needs of most industrial plants range from an intensity of 5 foot-candles to 50, and in some instances to 100. Authorities all agree on the need for good light, but they sometimes disagree over the exact lighting intensities wanted. The summary on page 68 is based on the minimum levels of illumination recommended by the

Working Conditions

FAVORABLE WORKING CONDITIONS—so obvious in this over-all view taken at Woodward Governor Company, Rockford, Illinois—invariably pay off in greater worker efficiency and lower unit costs

Illuminating Engineering Society of New York for various plant areas and seeing tasks.

Other characteristics of the work being performed also determine the intensity of the light required. For example, the worker may concentrate intermittently, or for long periods. His eyes may have the advantage of good contrasts, or the disadvantage of poor contrasts. He may be looking at large objects, or at fine details. His job may require average standards of accuracy, or may involve precision work. In any case, the more details a worker needs to see in order to do a proper job, the greater the intensity of light he must have at his workplace.

Supplementary lighting. The levels of illumination just suggested refer only to general lighting. In certain instances, supplementary lighting of higher intensity is needed. Levels of 200 to 500 foot-candles

SUMMARY OF RECOMMENDED STANDARDS OF ILLUMINATION FOR INDUSTRIAL PLANTS

SEEING TASKS	PLANT AREAS	MINIMUM LIGHT INTENSITY
Safe movement of persons Intermittent manual tasks	Corridors Inactive storage	5 foot-candles
Loading Packing Shipping Warehousing General processing	Boiler rooms Active storage Elevators Stairways Reception rooms	10 foot-candles
Ordinary physical tasks Drilling and riveting Handling bulk materials Glazing and enameling Checking and sorting Cleaning and grinding castings	Power plants Garages Foundries Drop forge shops Spray booths Rough assemblies	30 foot-candles
Medium inspection General assembly General fabrication Maintenance Fine grinding and beveling	Many plant areas Automatic machinery Testing departments Repair departments Drafting rooms	50 foot-candles
Small assemblies Fine bench and machine work Buffing and polishing High-speed work Fine inspection	Machine shops Assembly lines Finishing departments	100 foot-candles

or higher are desirable for precision work, such as extra-fine assembly, color identification, extra-fine inspection, and special jobs of sorting.

In appraising light intensities, remember that any artificial light falls far short of natural daylight. Direct sunlight at noon provides illumination of 8000 to 10,000 foot-candles. Therefore, many plants where processes permit provide as much window space as possible to take full advantage of natural lighting.

Quality of lighting. The adequacy of industrial lighting cannot be determined by foot-candles alone. Quality is an essential requirement. Factors that enter into quality include (1) amount of direct glare, (2) amount of reflected glare, (3) brightness contrast, and (4) color content.

Any lamp of moderate intensity will produce direct glare if placed within the line of vision. The problem of glare is not solved by low-intensity lamps but by proper placement and shielding.

Light sources for general lighting should be placed above the horizontal line of sight. Lamps for supplementary lighting are often necessarily located below the horizontal level of the workers' eyes. Hence they should be mounted and shielded so as to confine the illumination to the immediate working area for which it is intended.

Reflected glare is light reflection from shiny surfaces, such as enameled walls, glass, glossy machine areas, or finished materials. This form of glare is frequently harder to counteract than direct glare. The solution lies partly in proper placement and shielding of light fixtures, and partly in selection of colors and finishes of surrounding surfaces with low reflection characteristics.

Also to be avoided are high brightness contrasts. Lighting fixtures hung under a dark ceiling often produce too great contrast between the lamp and the surrounding area. Supplementary lighting fixtures arranged against dark walls may produce the same undesirable brightness contrast. For good seeing conditions, the brightness of the immediate surroundings should be no less than one-third that of the visual task, although in some situations greater ratios are acceptable.

For most tasks in industry, the color of the light has little or no effect on the clearness or speed of seeing. On the other hand, jobs calling for color identification or color matching do require certain color values of light. Color-matching equipment is available for such applications.

However, there are esthetic and psychological values to be found in the color content of industrial lighting. Furthermore, the color content of the lamps should be integrated with the colors in which the plant interiors are painted.

COLOR PAINTING—to build employee morale

The functional use of color painting in the plant to minimize visual fatigue and promote worker safety contributes to high productivity.

From the outset, we should keep in mind that there are about 150 distinguishable hues, and between 10,000 and 20,000 tints and shades. With such a variety to choose from, it is understandable that individual preferences do enter into the conclusions of color authorities.

Before an effective color job can be done in an industrial plant, two prior conditions must be assumed. The first is orderly arrangement of equipment. If the plant gives the appearance of clutter and disorder, not even the most skillful use of color can achieve the desired effect. The second condition is proper lighting. No amount of painting can overcome the handicaps imposed by insufficient light or glaring lamps.

Machines and mobile equipment. The traditional color for the stationary parts or body of the machine has been dark gray. While not offensive, this color is not exhilarating or particularly pleasing to the eye. Current preferences are running to medium gray, medium or dark green, brown, coral, and the less prominent shades of blue.

The control points of the machine—levers and switches—are often identified by color contrast to facilitate speedy and safe operation. The identifying colors are usually yellow and orange. However, a stripe or spot of color on a control part often provides sufficient identification without the risk of introducing an unnecessary distraction.

Color is often suggested in order to provide a contrast between the material being fabricated and the worker's seeing area, or that part of the machine directly behind and adjacent to the operation on which his eyes are focused. For example, the worker ought not to be required to handle aluminum, magnesium, or stainless steel against a background of light gray or ivory.

However, this recommendation for color contrast in the worker's seeing area, while appealing in the abstract, is often impracticable in application. Most materials to be machined are placed on metal or wood surfaces that do not allow for painting. On the other hand, bench tops provide good opportunities for contrast between the material and the seeing area.

Mobile equipment—trucks, movable bins, skids, overhead cranes and conveyors—can be painted in colors of high visibility, preferably some value of yellow or orange. Solid colors may be used, or alternate stripes of color and black.

Ceilings and walls. Where indirect lighting is employed, the reflection factor of the ceiling should be 85 per cent. If direct lighting is used, greater leeway toward lower values is possible. Where light is a more critical factor than color, white or near-white can be applied. Where color is the more important, ivory and tints of blue, yellow, or green are good choices. If desirable to de-emphasize pipes and beams overhead, a medium green or blue may be selected for ceilings as well as pipes and beams.

Upper walls, calling for a reflection factor of 50, may be done in colors such as light green or light buff. For lower walls, needing a reflection factor of only 25, a dark green or dark buff will be found satisfactory.

Beyond the seeing area on which the worker concentrates is usually a wall to which he glances from time to time. That wall can be painted a color that will give him maximum relief from eye fatigue. The value of the color is determined by the light intensity.

Occasionally colors are chosen to counteract prevailing temperatures, such as a color containing some red to make cool areas seem warmer, and blue or green to make hot areas seem cooler.

Floors and aisles. Certain types of work need light from below; hence the floor must contribute to proper light diffusion and reflection. Colors best adapted to this purpose are light gray and light green. In ordinary circumstances, a medium gray is suitable.

Aisles and traffic routes should be clearly marked. Boundary stripes may define the limits of the lanes, or the entire width may be painted in a color that sets it off from the working areas of the floor. Some companies have found that white is not satisfactory for floor boundary stripes. They find yellow or orange stripes are more quickly noticed, and command greater respect.

As a general rule, it is desirable to use colors that have been standardized. Codes have been written by the American Standards Association and other technical organizations for colors to designate machines, controls and switches, mobile equipment, aisles and boundaries, pipe identification, and safety, fire extinguishing, and first aid equipment.

It is considered good practice not to insist on the same colors for walls and ceilings throughout the plant. The morale of employees seems to be better served by a variation of color from department to department and from building to building. Some color advisers try to get such variation within each room. They accomplish this by painting one wall in a lighter and brighter color.

AIR CONDITIONING—for worker comfort

A properly conditioned factory atmosphere is more than a convenience. It is a necessity, since the air that is breathed sustains life, and the air that surrounds the human body affects comfort and health.

The public uses the term "air conditioning" rather loosely to denote a variety of features in atmospheric modification and control. The engineer, however, has specific requirements in mind when he uses the term. In this discussion the definition is that of the American Society of Heating and Ventilating Engineers, which includes these functions: (1) temperature control, involving heating and cooling; (2) moisture control, accomplished by humidifying or dehumidifying; (3) air movement, through distribution and ventilation; and (4) air cleanliness, achieved by various methods of filtering.

Heating. When heat has to be supplied to make

plant interiors comfortable, the temperature varies according to type of work. In warehouses, 55 degrees F. may be adequate, since the men are active and are warmly dressed. If employees are engaged in near-sedentary tasks, such as small assemblies requiring little movement except that of hands and arms, temperatures are probably best set between 70 and 72 degrees. However, because of local preferences and conditions, temperatures as low as 68 degrees or as high as 74 may be prescribed.

There are also other qualifying factors, such as the insulation of the building. A poorly insulated building sometimes requires a higher temperature than one that is well insulated.

Cooling. In hot weather most people function best in interior temperatures cooled to 78 or 80 degrees. Occasionally the temperature is raised to 82 degrees, but preferably not higher.

Cooling temperatures are affected by heat leakage through walls and windows, also by heat introduced from without by the sun, and by interior heat produced by electric lights, appliances, steam pipes, and the number of occupants.

Humidifying. In discussing optimum temperatures, nothing was said about humidity. Yet neither of these factors can be determined alone.

In an atmosphere heated to 72 degrees, most people—97 per cent in fact—feel maximum comfort with a relative humidity of 30 per cent. Outside temperature conditions also influence the amount of humidity introduced into heated air. In mild weather, the humidity may be raised to about 40 per cent. In extremely cold weather, the humidity should be kept at approximately 20 per cent if the building contains single-glass windows, and at 30 to 35 per cent for double-glass windows. It is a general rule that as the humidity rises, the temperature must go down to maintain comfortable conditions.

Dehumidifying. In most applications, summer air that is cooled must be dehumidified in order to provide maximum comfort. A humidity of 50 per cent is satisfactory for most people under most plant conditions. Occasionally, manufacturing processes require either a higher or lower moisture content. In these cases, personal comfort must give way to technical requirements.

Distribution of air. For proper comfort, conditioned air should be distributed throughout the enclosed work space so that:

1. Temperature throughout the occupied zone is essentially uniform.

2. Temperature difference between the floor and breathing line is minimized.

3. No sensation of draftiness is felt by the occupants of the room.

4. No disturbing noise attends the circulation of the air.

An air velocity of 25 feet per minute is acceptable. If it approaches 50 feet per minute, employees begin to complain of drafts. In summer, the air velocity may be increased somewhat without discomfort.

Ventilation. The volume of outdoor air needed to keep the temperature and other conditions under control varies greatly. In a low-occupancy area, one or two fresh air changes per hour are sufficient. Heavy occupancy requires two to five fresh air changes per hour. Factors influencing amount of ventilation are temperature; prevalence of tobacco smoke, odors, and fumes; number of people affected; and physical characteristics of the room.

Winter heating, in average circumstances, requires 8 to 10 air changes per hour in a given space. Like many other specifications, this is subject to variation, depending on building heat-loss, heat supply and room air temperatures, type of work performed (whether employees are sedentary or active), size and shape of room, and other factors.

Filtering. Often filtering of air receives only the attention required by varying state regulations for removal of ingredients harmful to health. Although nonregulated contaminants may not affect a worker's health, they can make working conditions unpleasant for him.

Equipment is available to remove offensive dust, lint, pollen, bacteria, yeasts, and spores. It is equally important that both heated and cooled air be filtered.

Partial air conditioning. Many industries do not find it feasible to air-condition plant interiors completely. Hence the comfort of employees must be subordinated to other factors. In such plants, partial air conditioning is the answer.

The most elaborate system short of full air conditioning includes the following elements:

1. For winter—heating, humidifying, distribution, ventilation, and filtering.

2. For summer—distribution, ventilation, and filtering. Such a system incorporates all the features of complete air conditioning except cooling and dehumidifying in summer. Another effective partial system is limited to heating, ventilation, and distribution. Other combinations may be devised to suit prevailing circumstances.

Additional factors in air quality. There are additional factors in the control of air quality that are not usually considered a part of air conditioning. They are (1) odor control, (2) air sterilization, and (3) control of toxic gases.

Odor concentrations may be reduced by dilution, by absorption, or by neutralization. Dilution makes use of a greater stream of outdoor air than would otherwise be brought in by the ventilating system. If there is an odor problem, the air circulated in the room should include a sizable percentage of outdoor air, probably higher than 25 per cent.

Absorption of odors is accomplished in various ways. One method is by passing the air drawn from the room through a filter of activated carbon before recirculating it. Some odors may be reduced by an air washer. Others can be neutralized by chemical action. In this method, a vaporizer injects a neutralizing chemical into the air stream.

Two major methods of air sterilization are available—the ultra-violet lamp and the glycol vaporizer. However, in industrial plants air sterilization has thus far been little used. Food processors and drug manufacturers are employing it for product protection. As yet there is not enough experience by which to

appraise its value to industry in terms of benefits to employees.

The chief use so far of industrial air sterilization has been in infirmaries, restrooms, eating places, and offices. The data from these experiences should ultimately be helpful in determining the feasibility of air sterilization in production areas.

If toxic gases are present in small amounts, the remedy may be to dilute the air with streams of outdoor air brought in by the ventilating system. Greater concentrations of toxic gases may be drawn off through local hoods equipped with fans. Or a combination of the two methods may be employed. It is sometimes necessary to keep people out of areas containing toxic gases until the air has been checked with instruments and found safe.

NOISE and VIBRATION CONTROL—to lessen fatigue

Noise reduction and vibration control are closely related. For present purposes, the difference in consideration of the two is that noise is airborne vibration of audible frequency; vibration is physical motion transmitted by machines, floors, and other plant facilities.

Noise is a necessary though unfortunate byproduct of many industrial operations. It is necessary in the sense that much of it cannot be prevented. On the other hand, something can almost always be done about excessive noise.

Noise is excessive when it disturbs and distracts workers. Irregular noises in an otherwise quiet atmosphere are just as annoying as continuous high noise levels. High-pitched noise, such as from a cutting tool, can set nerves on edge.

Generally speaking, a noise level over 50 decibels is annoying, while 90 decibels can be harmful to the ear. The noise level in the average office is 45 decibels. A reduction of 10 decibels from any level is equivalent to an average reduction in loudness of 56 per cent. An added reduction of 6 decibels would reduce the original intensity by about 73 per cent.

Reduction of noise at source. The most obvious way to reduce noise is to get less noisy equipment. Or when ordering new machines, list quietness of operation as one of the specifications. Another step in noise reduction is to keep machines in good running order. If maintenance declines, noise is almost sure to increase.

Isolation of noise. In some instances noise can be isolated so that its disturbing effect will be felt by fewer people. In one plant a noise baffle was built around a testing block for diesel engines, with the result that some of the noise was partitioned off. Another method is to provide well-insulated partitions and tightly closing doors between a noisy room and adjoining areas.

Sometimes a noisy machine is removed from a room containing many people, and located elsewhere. If possible, noisy departments should be segregated.

Absorption of noise. Despite all efforts to reduce and to isolate industrial noise, much of it will remain. It can be lessened only by sound absorption. Offices first began to use sound-absorbent materials 25 years ago. But industry has been somewhat slower in attacking the noise problem in production areas, except where it has been extreme. Management can still profit from the known benefits of noise reduction in many plant areas.

The most widely used sound absorbents to date have been applied to ceilings and walls in the form of tiles, blankets, boards, acoustical plaster, or sprayed-on composition. These materials absorb 30 to 90 per cent of the initial sound. The extent to which they can reduce the noise level varies according to the pitch and intensity of the sound, characteristics of the room, and the qualities of the material.

More recently, another efficient type of sound absorbent has been developed for industrial plants. It is a conical-shaped disc about 14 inches in diameter that is hung from the ceiling of a room at a height of 10 or 12 feet above the floor. This type can be used in a room having skylighting and a roof ventilating system, or it can be installed where the ceiling is not of uniform height. Using one cone for each 5 square feet of space has given excellent results.

Vibration Control. How does a plant know when it has a vibration problem? The answer is—when the vibration becomes detrimental to instruments, machines, or buildings, or annoying to workers.

There are three general attacks on the problem of excessive vibration: (1) prevention, (2) isolation, and (3) shock absorption.

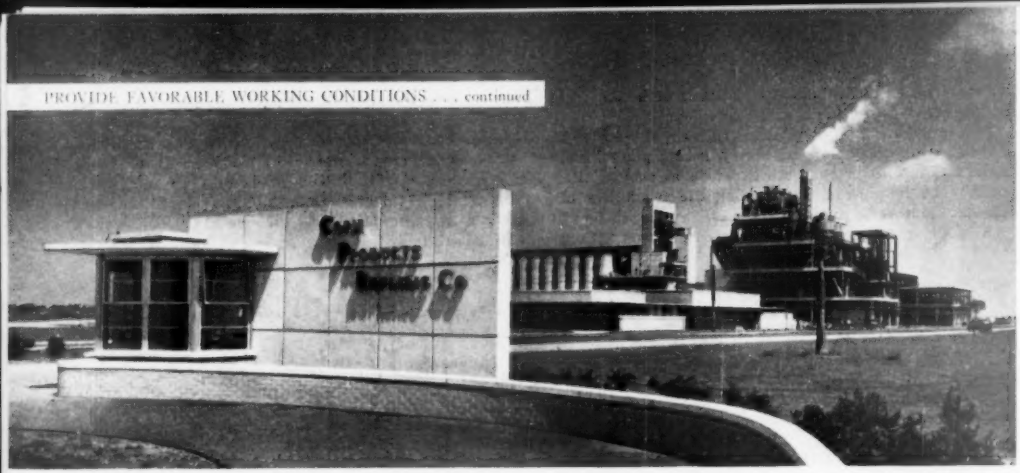
Vibration prevention. Some machines have been engineered better than others, so that vibration is held at a minimum. Industrial purchasers would do well to weigh this factor when selecting new equipment. Other preventive measures include proper installation of machines, efficient operation, and good maintenance. In some types of machinery, the improvement of the dynamic balance of rotating parts will eliminate much or all of the disturbing vibration.

Vibration isolation. Vibration that has not been prevented, or cannot be remedied, may frequently be reduced by isolation. Troublesome machinery is often set on concrete platforms whose foundations are independent of the foundation of the building. Or it can be mounted on or suspended by isolators made of rubber, cork, felt, steel springs, or other materials. When a machine is resiliently mounted, all connections between the machine and its foundation—such as piping, conduit, and control rods—must be flexible.

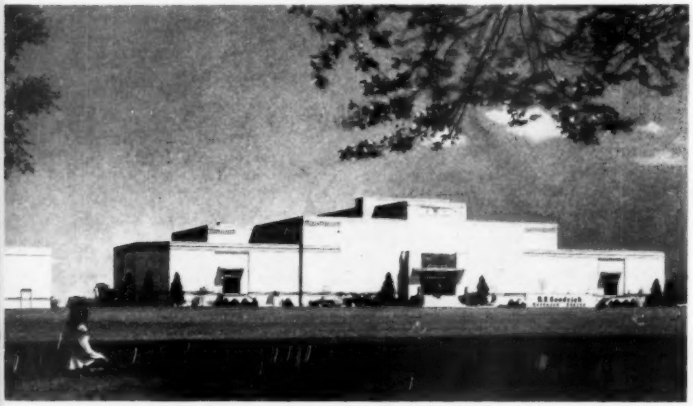
If 90 per cent or more of the vibration is thus eliminated, the results are considered excellent. If 75 per cent, they are good. If 65 per cent, they are only fair. Usually the reduction of vibration also reduces the noise level.

Shock absorption. Impact shock is common to the operations of punch presses, drop hammers, hydraulic presses, and other heavy machines. Unlike vibration, the blows occur intermittently, and the natural frequencies are irregular. But they are very disturbing to machine operators and adjacent workers. The solution for this also is isolation.

Continued on next page



NEW NOTE in process plant construction. Exterior attractiveness was a conscious aim of both the architect and Corn Products Refining Company when they designed this Corpus Christi, Texas, plant



NAME THE SCIENTIST OR RESEARCHER who wouldn't like to work in a completely air conditioned laboratory like B. F. Goodrich Company's good-looking research center recently built at rural Brecksville, Ohio

CLOCK TOWER at Ciba Pharmaceutical Products, Inc., Hoboken, N.J. is sightly, also hides stacks and tanks

EXTERIOR BEAUTY—to attract the best employees

Not until recent years have industrial plants begun to take pride in appearance. Several factors have been responsible for this trend. Many large companies have established branch plants in new locations. Factories have been moving into towns and small cities. A new class of employees has been recruited. In short, new concepts of community and employee relations have emphasized the esthetic as well as the functional aspects of industrial architecture.

The production demands of World War II gave modern industrial architecture its biggest boost. For the first time, large numbers of plants were planned from scratch. Usually they were located outside old industrial concentrations. It was possible to apply on a large scale the architectural and engineering advances of recent years, and to construct industrial plants that would meet the needs of people as well as machines.

Plants built since the last war have benefited from the wartime experience. Many new factories are including an employees' entrance that is just as impressive as that provided for the management and office staff. In some instances architects have been instructed to place the employees' entrance on the front of the building. Future plants will continue to incorporate modern architectural designs that serve utility, beauty, and personal dignity. The three plants shown above are good examples of the current trend.

Landscaping enhances the appearance of a plant, whether old or new. Before the new employee knows his way around the interior, he has become familiar with the attractive lawn, shrubbery, and trees. The seasoned employee is impressed with them each day as he arrives and leaves.

It is good practice to have the landscaped area extend in front of the factory as well as the office section. Proper maintenance of grounds costs money. But if the investment is to pay a dividend, the landscaping should always be maintained so as to stimulate employee pride and satisfaction.

Why Good Working Conditions Pay Off

The first and most important requirement of good physical environment in an industrial plant is that it must be functional. There must be dividends, immediate or long-range, if the suggestions made herein are to receive the serious consideration of management. Let us briefly appraise these dividends in relation to their source—the worker—and measure them by the effects of physical environment on his efficiency, health, and morale.

Operating efficiency. Good physical environment results in higher operating efficiency. With adequate lighting, for instance, there is greater ease of seeing and consequently improved accuracy. Maintenance tasks are made easier. When workers breathe clean, comfortable air, they are better able to keep up with production schedules. Productivity rises.

Effective use of color painting encourages good housekeeping. It also checks carelessness. If noise is held to tolerable limits, there is greater ease of communication. Oral instructions are more readily conveyed. Telephone conversations are more easily understood. Workers are better able to concentrate. Elimination of excessive vibration can mean better operating efficiency of both man and machine. Often it is possible to step up the speed of the machine and get greater output.

Good physical environment designed to encourage worker productivity also produces such valuable by-products as improved quality, reduction of rejects, better handling of materials, faster speed of learning, better utilization of floor space, longer life of tools and equipment, and improved supervision.

Worker health and comfort. Without restful and agreeable surroundings, employees may suffer from eyestrain, fatigue, nervousness, and colds and other respiratory diseases. All these disabilities contribute to higher accident frequency and absenteeism. On the other hand, good physical environment spells employee health and comfort, hence greater physical capacity to devote to the job.

Employee morale. Some years ago there might have been an argument as to whether the physical environment in which employees work has any effect on their morale and ultimately on their performance. Today there is no argument on this point. Experience has proved that good worker attitudes are a factor in worker efficiency.

Good physical environment not only enables workers to perform specific tasks better, but also improves their attitude toward their jobs, their fellow-workers, and the company. A good-looking plant exterior and good landscaping can stimulate a feeling of pride toward the plant and the company by both the worker and his family. Physical conditions within the plant encourage cooperation with supervisors, enthusiasm for the daily job, and pride in workmanship.

Physical environment therefore has an influence on personnel problems. If plant conditions are attractive, a more desirable type of worker seeks employment there. This is particularly true in a multi-industry town. Employees remain longer with the company. Should the plant be moved to a new town or to a new section of the same community, employees are more willing to move with it.

How You Can Improve Your Working Conditions

With proper management encouragement, helpful ideas for improving the physical environment will originate in the employee suggestion box. Or they may come from supervisors, foremen, and department heads. But employees must be convinced that the objectives are genuine. For best results, the interest of the chief executive officer should be manifested by continual efforts to eliminate justified complaints of unsatisfactory conditions.

More positive in action and results, however, is the determined policy of the management to provide the best working conditions it can afford. Recognition of the eventual economies of many improvements will convince management it cannot afford to delay them. Management thus minded will always be alert to investigate the potentialities of any idea for improved working conditions.

A dollars-and-cents evaluation of benefits is admittedly difficult to get. Worker good will, loyalty, and satisfaction cannot be measured in percentages. But they do show up in productivity and quality of workmanship, because of both the worker's greater physical comfort and his better mental attitude toward the company and his job.

Many companies are content to take the benefits on faith. But they don't have to. If the improvement has an employee relations angle, a company may sample the opinions of employees, their families, supervisors and foremen, and possibly visitors. If the improvement has been aimed at known obstacles to worker efficiency, the company can later develop supporting statistics from an analysis of production records, personnel and health records, maintenance records, and cost records.

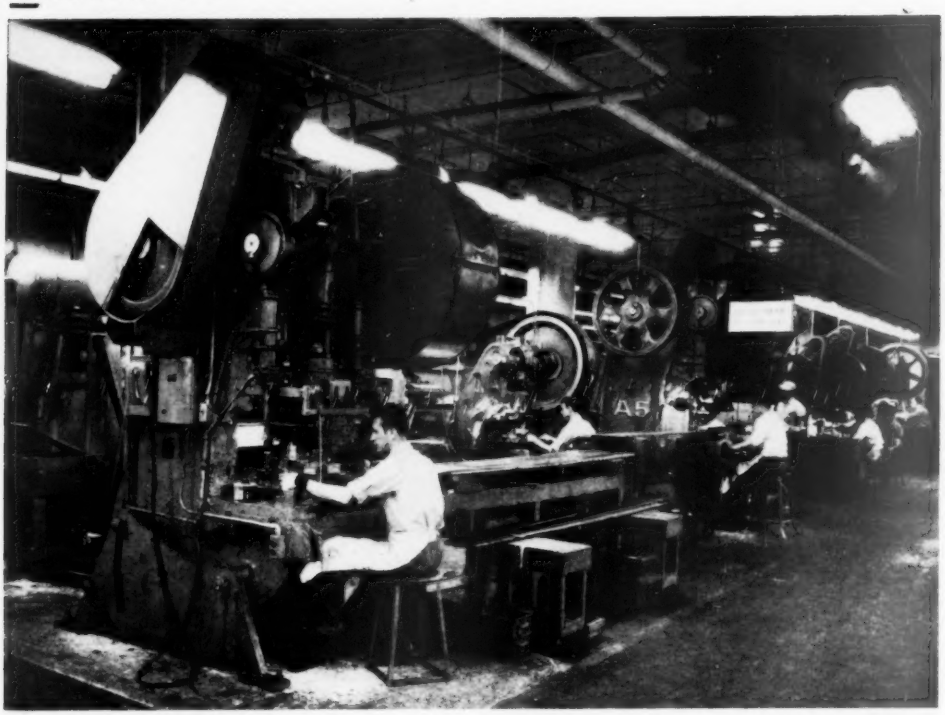
Whether an opinion survey or an accounting analysis is used for appraisal, management invariably finds that the results of providing good working conditions have justified the cost. On pages 74-85 FACTORY presents case examples bearing out this truth. Where possible, accurate evaluation of results is given. However, specific appraisal was not always possible because of the influence of other factors combining to improve worker efficiency. In such cases, however, the value of the improvement may be inferred from the clear-cut part it has played in achieving the stated objectives.

Another measure of the value of the various facilities conducive to good physical environment is the extent of their acceptance as necessary features in the new plants of 1949. Descriptions of three of these plants (see pages 86-91) show the uniformity of management thinking as to what constitutes good working conditions, whether for the small, medium-sized, or large plant. If these and many other new plants are at all indicative, then progressive management has ample evidence that good physical environment is one of the keys to high worker efficiency and lower unit costs.

Case Studies From 27

People do better work in a plant that has the best physical environment. Here are investments in good lighting, air conditioning, color painting, noise reduction, and vibration control that paid off

LIGHTING



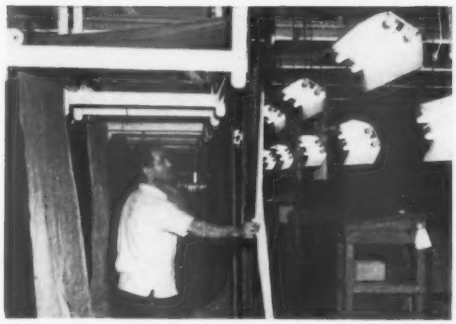
INCREASED LIGHTING INTENSITIES at Pitney-Bowes jumped punch press production 25 per cent. Good lighting from overhead fixtures plus local lighting at points of operation also cut product rejects

1 Production increased, rejects decreased, with better lighting. About 1½ years ago Pitney-Bowes, Inc., of Stamford, Conn., improved the lighting intensities in its punch press department. It reaped a 25 per cent increase in production. This increase stemmed from improved worker morale and productivity. Also, quality of the product was improved, leading to a reduction in rejects from 6 to less than 1 per cent.

The punch press department covers an area of about 8000 square feet. Overhead fluorescent lighting was arranged to give a general light intensity of 35 foot-candles at working levels. In addition, local fluorescent lighting of 100 foot-candle intensity was provided at each machine. This was done by mounting two 20-watt shielded lamps at the press throat, which was highlighted by painting the background area in a light buff color. This eliminated shadows at the point of operation.

2 Worker efficiency went up as light intensities were raised. Measured results of increased production and decreased spoilage have convinced the management of Bachmann Uxbridge Worsted Corporation,

Industrial Plants



INTENSITY of 200-foot candles from special lighting at Bachmann Uxbridge improved cloth inspection

Uxbridge, Mass., that good lighting for its workers pays. General lighting intensities as high as 80 foot-candles are now being maintained in some manufacturing areas.

In a series of unusual tests over successive intervals of about two months each, beginning in 1942, this company raised the lighting intensities in its weaving, spinning, and inspection departments and observed the results. All other working conditions were controlled at the original levels.

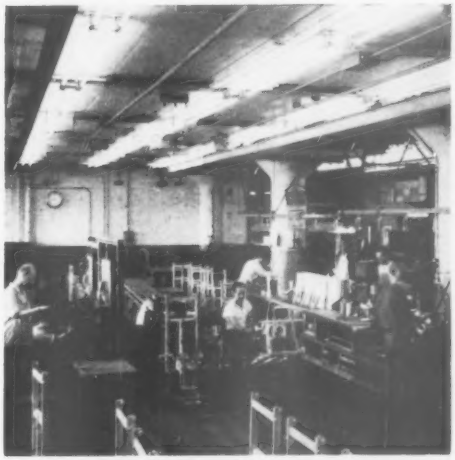
In the weaving department, light intensities were raised in three distinct steps, from 14-17 foot-candles (incandescent) to 32 foot-candles (fluorescent), then to 52 foot-candles, and finally to 70 foot-candles. Each test was made with the same looms, weavers, stock, and conditions. Weaving efficiencies, which are commensurate with worker productivity, *rose* an average of 4.6, 8.7, and 10.5 per cent above the original level. Mending costs, which indicate spoilage, *decreased* an average of 23.5, 33.6, and 39.6 per cent respectively below the original level.

In the wool yarn spinning department, yarn production *increased* an average of 9 per cent when the lighting was changed from 11 foot-candles (incandescent) to 42 foot-candles (fluorescent). At the same time the production of bad yarn *decreased* an average of 12 per cent.

In the final examining department, the natural light intensities from north daylight, varying from about 100 to 500 foot-candles, were replaced by a stable intensity of 375-400 foot-candles obtained from "daylight" fluorescent fixtures. This change resulted in a 10 per cent reduction in rejects of the shipped product by the purchaser.

Lighting facilities at Bachmann Uxbridge are designed to provide adequate general lighting intensities with specially designed local installations wherever difficult seeing tasks require higher illumination. General lighting intensities vary, for example, from 35 foot-candles in the mending and sewing, dressing, and dyeing and finishing departments, and 40 foot-candles in the carding and spinning departments, to 70 foot-candles in the weaving department. Local lighting is maintained at 125 foot-candles at sewing points in the mending and sewing department, and at 75 foot-candles at the reed in the dressing department. Many machines, such as warpers, tape condensers, sample looms, shears, and presses, are equipped with localized lighting giving similar or higher intensity levels.

Emphasis on good lighting in this plant is continued through a maintenance program that keeps lighting intensities where they are wanted. This program includes a daily inspection for replacement of lamp failures, and periodic cleaning of lamps and fixtures as conditions may require. In the dusty card room, for example, reflectors are blown out every 8 hours and wiped off weekly. All fixtures in the plant are washed at least twice yearly. In this way management is assured of getting maximum benefits from the good lighting it has proved is essential to high worker efficiency in a modern industrial plant.



UNSHIELDED CEILING runs of cold-cathode lighting are used at I-T-E to minimize shadows and glare

3 Cold-cathode lighting minimized shadows, spurred worker efficiency. When I-T-E Circuit Breaker Company, Philadelphia, expanded its manufacturing operations into an adjoining 8-story structure, it realized that the provision of good lighting was a definite factor in achieving high worker efficiency. Therefore in four floors of this building, containing machine shops and a storage area, it decided to install cold-cathode fluorescent lighting.

Each floor is 96x400 feet in outside dimensions. After deducting the 5600 square feet utilized for restrooms, stairwells, and elevator ways from this

over-all area, this left 32,800 square feet on each floor to be illuminated. Ceilings are 11½ feet high. Each floor is divided into bays 20 feet square, and has a 16-ft. center aisle.

The original lighting system consisted of a single incandescent fixture in the center of each bay, and one fixture in each of the four corners. Light intensities at work level varied considerably, and were a maximum of about 10 foot-candles.

In the new installation, three double rows of continuous 20 mm. lamp tubes were run the length of the floor through each row of 20-ft. bays, and two single rows were run along the length of the 16-ft. center aisle. A shade of 3500-deg. white was selected as most suitable. The tubing was mounted unshielded close to the ceiling, giving the effect of a higher ceiling and natural, glareless, open-sky illumination. The running tubes also minimized shadows because light comes from all angles.

Average light intensity at work levels was 35 foot-candles, fairly even distributed over the whole area. Low maintenance costs after three years of service were an extra factor in the company's evaluation of the benefits from its cold-cathode lighting.

HIGH LEVEL OF ILLUMINATION from criss-cross fixtures at Krisson satisfies demands of close work

4 Better lighting in British plant improves quality, efficiency, and morale. A modernized lighting system at Krisson Printing Ltd., London, was designed to insure high-quality workmanship and high productivity by elimination of worker eyestrain and provision of greater seeing comfort.

This plant occupies the basement of a large, modern building. The ceiling is 9 feet above floor level. There is no daylight except in one part of the front office. Production operations are carried out in artificial light the year around. In nearly all operations accurate study of small details requires good light.

The old lighting set-up consisted of general overhead lighting by single-filament lamp fixtures controlled by wall switches. This was supplemented by local lighting with individual switches over points of machine feeds and deliveries, compositors' frames, etc. Frequent moves of equipment, as new machines were installed and plant layout was improved, had resulted in trailing wires and a multiplicity of switch points. Plant appearance was untidy and illumination patchy. Despite careful choice of wall and ceiling colors for high reflective power, the plant looked dull and the ceiling low.

In the new set-up the concept of general plus local lighting was abandoned in favor of a high level of general illumination sufficient for all operations. Interchangeable fluorescent fixtures, using one or two 5-ft., 80-watt "daylight" lamps, were chosen as standard. These fixtures were of the "quick-release" type, with connections to the power supply by removable plugs. This design facilitated removal for cleaning or replacement for repair.

A pattern of lamp-placing was conceived that could be applied to the whole ceiling area irrespective of machine layout. Glare was minimized by selecting anodized aluminum fixtures having a dimpled surface that gives a soft reflection. Over-all concentration of lamps made diffusers unnecessary.

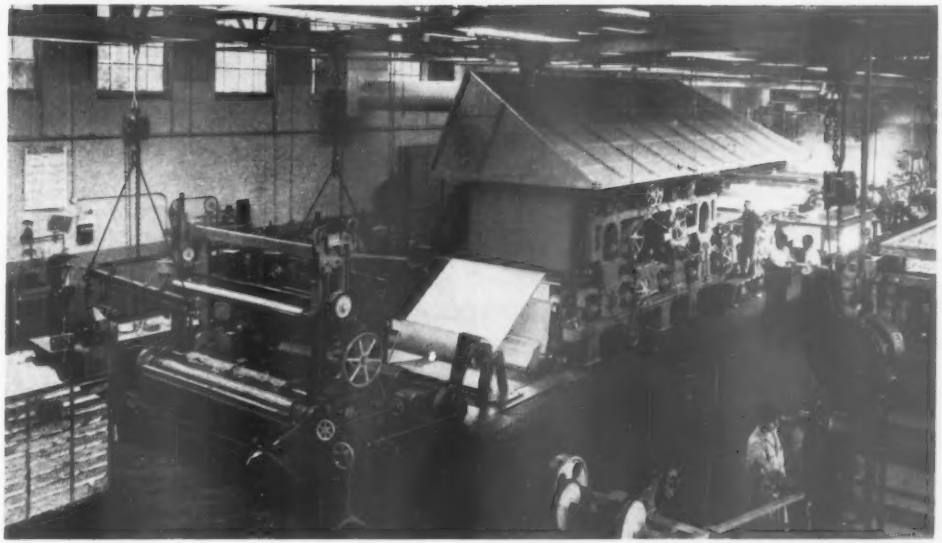
Fixtures were arranged in two sets of parallel rows, crossing each other at right angles, so that in any single row each space between two adjoining fixtures was intercepted by a fixture at right angles to these fixtures. This orientation provided almost shadowless illumination. Also, the arrangement made for flexibility. Machines can be shifted or turned through 90 degrees, or whole departments can be moved, without significantly affecting the level of illumination at the working surface. If for any reason higher intensity is needed at a given point, any number of one-lamp fixtures can be replaced by those of two-lamp design.

Convenient switching is accomplished by group wall switches controlling an average of three separate sections in each department. In addition, a pilot switch at the front entrance operates strategically placed lamps, not on any other switch circuit, throughout the plant.

The level of illumination of the new system is two and one-half times greater than the old, at an increase in power consumption of only 8 per cent. Whereas the previous levels varied about 500 per cent, the new levels vary only about 30 per cent. This fairly constant level of illumination over the entire working area gives an impression of light, spaciousness, and unity to the plant not formerly achieved. Even the ceiling seems higher.

Employee morale has been considerably improved. Headaches from eyestrain are unknown. While definite figures of increased output directly attributable to improved lighting are impossible to give, it is a fact that production on several operations has risen since the new installation. Also, there has been less spoilage and fewer errors in typesetting. The company is confident that the substantial cost of its new lighting system is being fully justified by the direct and indirect benefits in accuracy, output, and worker morale.

COLOR PAINTING



COLOR PAINTING of plant and machinery at Smith Paper, Inc., resulted in improved housekeeping and fewer accidents. Dangerous rotating parts and emergency switches now stand out in sharp relief

5 Repainting in colors played a major role in improving plant housekeeping. Walls at Smith Paper, Inc., Lee, Mass., used to be white. Now the entire plant is painted in colors. Machinery, particularly dangerous rotating parts and emergency switches, stands out in relief.

Repainting was only part of an over-all plant improvement program to provide better and more efficient working conditions. Therefore how much it contributed towards that achievement is impossible to tell.

But this much is known. There is better plant housekeeping. Employees tend to keep their machines and the areas around them cleaner and neater than before. And eye fatigue has been considerably reduced. These advantages are undoubtedly a big factor in the noted reduction in accidents.

6 Long-range color painting program boosted operating efficiency 11 per cent. The Wire Rope Division of Jones & Laughlin Steel Corporation earned big returns on its investment in a color painting program in its plant in Muncy, Pa. Application of colors was started in August, 1945. Gradually plant buildings and machinery were painted in a color scheme designed to provide greater worker safety, improve morale, and increase output. The paint job was completed in May, 1947.

Success of the color program is very well demonstrated by the following facts, developed after three years of operation under the new color conditions. Management believes an appreciable portion of these benefits can be credited to the color painting program:

1. Number of accidents that resulted in lost time was reduced by 38 per cent.

2. Absenteeism was reduced from about 5 per cent to less than 2 per cent.

3. More direct evidence of an improvement in employee morale was a reduction in labor turnover from 4.5 to 0.4 per cent.

4. Most telling evidence of the value of the program, however, was an increase in machine efficiency from 86 to 96 per cent. The company believes the use of functional and restful colors among complicated whirling machinery helped make this possible through a reduction in operator fatigue caused by nervous tension and eyestrain.

5. Housekeeping benefited, too. Plant clean-up problems were simplified because employees were taking greater pride in the appearance of their machines, and were more interested in the cleanliness of their work areas.

6. An indirect benefit was the improved see-ability of workers, gained from more efficient utilization of existing lighting facilities.

As a natural result of the foregoing benefits, production improved both in quantity and quality, leading to increased product sales.

7 Painting in color transformed coke basement into an attractive workplace. Functional use of color painting in the basement beneath the coke ovens of the Carnegie-Illinois Steel Corporation, Pittsburgh, has destroyed any impression that it must be a drab mass of dusty concrete, stained from smoke and cluttered with equipment and debris.

Forced-air circulation through the basement does the practical job of reducing the room temperature,

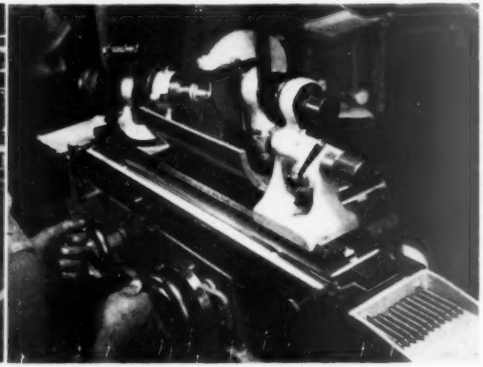
but the cool cascade blue on the ceiling, the hottest point, performs a psychological miracle. Men working here manipulating ceiling valves are comfortable in heavy work clothing, although the ovens above sometimes reach temperatures as high as 2500 degrees Fahrenheit.

Upper walls and columns of the basement are done in a pleasant shade of sun-tan yellow. Bands of tile-red encircle the bottom 18 inches of the columns. The same color is used on the concrete floor, which is waxed and kept scrupulously clean by a vacuum system. Piping, gas inlets, and valves are painted black and cream so that they may be easily identified.

Inverted bracket lamps located about halfway up on alternate columns give a hotel lobby atmosphere.

Heat is actually reduced by drafts of cool air distributed across the basement through louvers in a wind tunnel extending along one side of the basement. All air required for combustion in the ovens above must first cross the basement from the inlet side to the other. Two to three times as much air as is required for combustion is circulated through the basement. The excess escapes through openings on the outlet side. Maintenance of this positive air pressure prevents infiltration of dust and smoke. It also helps to clear the atmosphere of any fumes incident to basement operation.

As a result, it is possible to maintain basement temperatures within 10 to 15 degrees above normal atmospheric temperature. Color painting is effectively counteracting the slight physical discomfort from these moderate temperature differentials.



PAINTING OF TOOLROOM MACHINERY in color at McDonnell & Miller was liked by workers so well the plan was extended to all shop equipment. Workers say sharp contrasts relieve eyestrain

8 Color on old equipment was the finishing touch this new plant needed. McDonnell & Miller, Inc., of Chicago, found to its amazement that a beautiful plant, outside and inside, did not alone make for the pleasant and safe working conditions it desired for its employees. It noticed that the production machinery, assembly benches, and special test racks brought over from the old plant or newly purchased actually appeared shabby.

There was no consistent color scheme, but a confusion of impressions. For example, sitting in one corner might be a big compressor painted orange as purchased from the manufacturer. Right next to it might be a drill press painted in a dirty gray. Shapers, planers, punch presses, and so on down the line, all came from the various manufacturers in different hues and colors. It was a problem to keep these machines well painted in their original colors, yet the idea of using a one-color drab-gray paint to make them alike was not attractive.

The company investigated the possibility of using functional colors recommended by a paint manufacturer. A trial was made on the toolroom equipment. The company was anxious to observe the effects of color not only on the toolmakers but also on the men in all surrounding departments as well.

Even before the job was finished the workers in the machine shop asked to have their machines similarly treated. Assemblers, too, liked the color scheme. The men in the soldering department and the grinding room added their requests for color treatment.

In consequence, about a year ago the entire plant interior was painted, and has since been repainted to keep equipment bright and fresh. Production machines are painted green; worktables, operating arms, and moving parts are buff; electrical controls and boxes are red. The floor of the entire plant is of cleaned and washed concrete, with red stripes.

All assembly benches are painted swamp green. Test racks are silver and red. All exhaust piping and stacks are painted in silver.

Inside walls of the plant are painted in two colors —white upper portion with a light gun-metal gray near the floor line. Washroom walls are light tan above the dado. Ceilings are all white.

The results, aside from the bright and cheerful appearance, have been gratifying. Morale of workers was greatly improved. They also take a greater pride in keeping machines cleaned. Even their personal appearance has improved. Another important thing noted by management was the relief of eyestrain.

Typical of the transformation color painting has made in all departments is that of the boiler room, where one expects only a fair degree of good housekeeping. Color treatment has inspired such an immaculate appearance that one feels like taking off his shoes before going inside.

Summed up, the program definitely contributed to improved worker morale and efficiency, as well as reducing the plant housekeeping problem.

CLEAN AIR in Kirsten Pipe Company's buffing room means more comfortable workers, hence higher output

9 Dust elimination in buffing rooms is the key to higher output and better product. Control of dust was a major part of the program of Kirsten Pipe Company, Seattle, Wash., to provide ideal working conditions in its new plant.

Early experience convinced the plant engineers that clean air and pleasant buffing room conditions are reflected in quality of product. Inadequate dust control meant floors littered with metal particles, buffing and polishing compounds, and shreds from some 80-odd buffing wheels used daily. It also meant that the air was permeated with fine lint which impaired breathing and restricted visibility, with a resultant decrease in quality and volume of production, and an increase in labor turnover.

To provide for possible intermittent operation with adequate air balance and regard for space limitations, the dust control layout was set up as three separate mechanical exhaust systems. Each was designed to handle 5000 cfm. Dust collection chambers with suction fans and related equipment were located in the basement. Ductwork was brought up through the floor to individual machine locations. Each system has six air filter units, arranged in two rows of three each, with a total filter media area of 480 square feet. Each air filter unit consists of seven removable pockets that hold fireproof glass fiber sheets. Sheets are easily and inexpensively replaced when the pressure drop from accumulated dust becomes excessive. Motor-driven vibrators installed on each system automatically remove the dust from the surface of the glass sheets.

Replacement intervals of the glass sheets vary with the type of the load. One of the systems, collecting a light dustload, has operated satisfactorily over 1576 hours. Another, handling heavy buffings, required sheet changes after 656 hours.

All hooding for buffing and polishing equipment was coordinated with production operations to facilitate the handling of pipe and cigarette-holder trays. Each group of wheels has individual exhaust connections with a trap from each wheel to retain fallen tools, compound blocks, and working materials. Foot rests for operators to reduce fatigue, and use of rubber deflector sides to assure dust control without interfering with operations, were design features incorporated in one series of exhaust hoods. Approximately three barrels of buffing wheel lint, compound, and metal dust are removed daily from the filter section. Additional large quantities are removed from the traps at the machines.

Because exhausted air during winter months means lost dollars in heat loss, Kirsten arranged to return it to the rooms from the dust arrester, mixed with a minimum of outside air. This was possible because this air after filtration is clean and includes no health hazard. This installation, with recirculation operative, provides a pleasant atmospheric condition with 45 air changes per hour.

SELF-CONTAINED air cooling units in entire plant at Macnick are helping worker morale and efficiency

10 Keeping workers comfortably cool in a Tulsa plant is paying off in high productivity. In 1941 the Macnick Division of Ohmer Corporation installed the first two of its 12 cabinet-type air conditioning units. A 5-ton unit was installed in its general office, with a duct system supplying all individual offices. A 3-ton unit was placed in one of its separate final assembly departments employed in assembly, rating, and final calibration of a watch-size instrument.

Although the office installation was made primarily for comfort, it proved to be of material value in the engineering section. Here it made possible deeper and more concentrated application of thought to complicated problems of design without distracting discomfort. In the assembly department it was apparent, before long, that greater employee comfort was bene-

ficial to the tedious handling of small, intricate parts. Not only was such comfort reflected in better quality of workmanship, but also in fewer re-runs to attain accuracy in calibration.

There followed an installation of another 5-ton unit in the inspection department for precision parts. First consideration here was the control of temperature and humidity conditions in order to assure better standards of measurement.

Later another final assembly department was moved into this same area. The beneficial effect on employee morale and quality of workmanship was similar to that observed in the first installation.

Experience gained from these first three installations convinced the management that it should equip the entire plant with cabinet units. This was done before the summer of 1945. The same benefits were apparent in all parts of the plant.

In a further expansion of the plant, the new area was likewise equipped. At this time the advantages of the self-contained units in flexibility of layout became apparent. It was necessary to rearrange factory fixtures and machines throughout the plant. All except two of the twelve units had to be moved, involving only slight changes in the supply and return condenser water pipes. Since then the units have continued to function usefully in maintaining good worker efficiency born of bodily comfort, and the company considers them an excellent investment.

UNIFORM DISTRIBUTION of clean, tempered air at Reliance Engineering is assured by ten duct systems

11 Worker efficiency reacts favorably to provision of clean, comfortable air. So says management at the Reliance Electric & Engineering Company. A good heating and ventilation system for best worker comfort was therefore one of the "musts" in its recently built Ashtabula (Ohio) plant.

Actual operation for almost two years has proved its over-all economy. The company estimates that the new system is probably worth 5 per cent in worker efficiency on days of extreme temperatures, and an average of 1 per cent or better the year around. Also, employee complaints on individual or local conditions, summer or winter, are fewer than they were before the new system was installed.

From a strictly engineering viewpoint, the system achieved compact layout, high operating efficiency, and ease of maintenance—despite the high-bay, single-story construction in an area 480 feet long by 250 feet wide. Flexibility of control and minimum ductwork to obtain uniform heat distribution were attained. This was made possible by using ten identical but independently controlled duct systems which discharge air from outlets 8 feet above floor level on each building column.

The combined systems can move as much as 18,000,000 cubic feet of air per hour. This capacity maintains a positive pressure inside the building, at 1½ inches water gage, to minimize dirt and moisture infiltration. It provides six complete changes of filtered air in the summer, and three of tempered air in the winter. The increase in summer capacity is effected by an extra fan in each ductwork system which is used only during summer weather. The other fan operates the year around. Both fans are mounted inside the supply ductwork.

Each of the ten systems serves a plant area 80 by 125 feet through six discharge points. Air is drawn through a louvered inlet located just below the roof line, and is filtered in the first of two plenum chambers. Removable filters of the washable, viscous type are used.

The second plenum chamber has ample space for addition of cooling coils should summer cooling become desirable. From here the conditioned air is drawn over steam coils preceding the axial fans, and is discharged through the fans into the main supply duct leading to the six branches. Flow is balanced by dampers in the branches. Chambers and fans are mounted on overhead platforms.

Natural ventilation of the building is achieved through eight gravity-type roof ventilators, 66 inches in diameter, equipped with pneumatically controlled lower dampers.

The entire system assures clean and properly tempered air for all areas of the building.

12 Efficient dust control system keeps enclosed areas clean and healthful. Coupled with the aim to provide a most efficient abrasive wheel manufacturing plant, Norton Company designed its recent 15-acre one-story addition to its large Worcester, Mass., plant group to insure the most modern and pleasant working conditions for its employees.

Control of abrasive dust was one of the prime requirements in all stages of the process. Such dust not only would shorten machine life but also cause unpleasant and unhealthful working conditions.

A continuous self-cleaning dust collection system was found to be unusually efficient. For example, the exhaust air, after removal of dust, contains only a small fraction of the maximum dust particles permitted by state regulations. This means that the exhaust air can be recirculated into the working area

instead of being blown outdoors, with consequent loss of heat in cold weather. As a result, the yearly saving in plant heating cost alone is almost $4000.

Another substantial saving was the capital investment cost of extra heating equipment that would otherwise have been required.

Heating in the new plant is supplied by horizontal-coil unit heaters, located overhead, using hot water as the heating medium. The heaters are of the revolving-head type. Each is thermostatically controlled. In the summer the heater fans are run to help circulation of the air caused by the flow of exhaust air from the dust collection system.

The roof consists of pre-cast concrete slabs, overlaid by a 2-in. layer of thermal insulation to keep winter heat in and summer heat out.

A modern fluorescent lighting system provides a general illumination of 25 foot-candles at working levels. At inspection benches the intensity was increased to 50 foot-candles, and to 100 foot-candles at benches where close work is done. In the daytime considerable natural lighting reaches most of the plant through window areas in large roof monitors.

Good lighting was facilitated by a careful study of the color scheme for painting the building and machinery. Two shades of green were selected as being most restful to the eyes, and were used in repainting the older buildings of this plant group as well.

In the absence of a high noise level in the shop area, noise reduction was not necessary. Noise conditioning, however, was provided in the cafeterias, hospital, and all plant offices.

Just exactly how much the dust control system and other good working conditions have contributed to high productivity obviously cannot be evaluated. But no one questions their worthiness!

13 Adequate supply of fresh air in foundry assures best worker efficiency. Workers in the foundry building of Federal Mogul Corporation, Detroit, need a healthful atmosphere in order to work efficiently. Mechanical ventilation has been provided to remove the contaminated air through an elaborate exhaust system. Make-up air is required to replace the exhausted air at the rate of 220,000 cfm.

In cold weather this make-up air must be tempered to assure a supply of comfortable warm air. This is accomplished by an installation of ten oil-fired and gas-fired space heaters located around the plant. Each heater is rated at about 22,000 c.f.m. and has an output of 2 million Btu. per hour. Fresh cold air is drawn from outside the plant through ductwork to each heater and is discharged from directional outlets as warm air into working areas. At zero outside temperature a discharge temperature of 85 degrees is possible.

In the summer the space heaters function merely as blowers bringing fresh air into the plant, and thereby maintain the efficiency of the mechanical exhaust system.

In other words, this installation is maintaining more comfortable working conditions all year around. It therefore assures better worker efficiency.

14 Enclosure for rolling mill operator was designed for comfort and efficiency. Rolling mill operators at The Timken Roller Bearing Company, Canton, Ohio, don't have to take the physical punishment that formerly was a necessary part of this job. They

SAFETY-GLASS enclosed pulpit shields Timken rolling mill operator from heat and chips, makes job easier

sit comfortably within a steel-framed safety glass enclosure that shields them from the heat of passing white-hot billets and protects them against flying chips. This protection given by each pulpit, as it is called, allows an operator to concentrate on his work and to do a smooth and efficient job.

The pulpit is located about 8 feet above and 5 feet away from the coilers, for good visibility. The operator's seat is spring cushioned in a steel frame which tilts or swivels easy for bodily balance. Electrical control switches on either side are arranged so that the operator can transfer to the upper or lower levers by a natural forearm motion. Sliding side panels permit an adjustment for ventilation. No controls are placed in front, to avoid strained posture.

The comfort, safety, and visibility thus provided have proved worth while in improving the pulpit operator's efficiency and reducing his fatigue.

15 Prevention of oil mist in machine shop insures clean air. Oil mist escaping from automatic machines in the screw-machine room at Wolverine Brass Works, Grand Rapids (Mich.), made working conditions unpleasant. It was hard to keep machines clean. Workers breathed oil-contaminated air.

This problem was solved by enclosing the machines with ventilating hoods that exhausted through ductwork into an electrostatic precipitator. Each hood was built as airtight as possible, and provided with a hinged front cover that could be raised and lowered at will to get at the operating head.

This installation paid for itself in many ways. Besides improving the working conditions, it salvaged the oil that formerly was deposited on all the walls, floors, and other equipment. Also, cost of cleaning the premises was greatly reduced.

ROOF SPRINKLING SYSTEM helps keep workers in the Hallicrafter plant cooler on hot days

16 Water spray on plant roof cools work areas on warm, humid days. Ever since Hallicrafters Company, Chicago, moved into its new plant some two years ago it has used a roof sprinkling system to help cool the factory work area. This system under normal conditions reduces the temperature inside the building 8 to 10 degrees. Heat-retarding, glare-diffusing window glass is used in sun-exposed areas.

Total roof area sprayed is 100,000 square feet. Outlet nozzles are spaced to cover areas 10 to 25 feet square. Total water consumption is about 5 gallons per minute.

The company finds that worker efficiency is not affected in hot weather when the spray system is operating. In fact, the cooler climate eliminates the need for sending workers home on hot days, thereby curtailing both pay and production. Employees like the system and seem to respond psychologically to the sight of water dripping on the skylights overhead.

17 Comfortable temperatures were near the top of the "must" list for a new paper box plant. With an eye to employee comfort as well as process efficiency, Stecker Paper Box Company, Detroit, employed several methods for maintaining satisfactory working temperatures at all seasons.

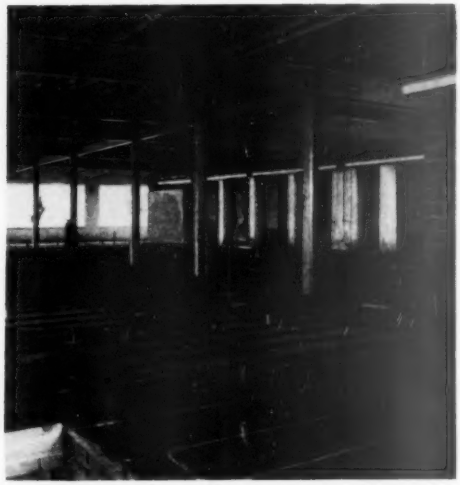
For example, the plant's heating system utilizes three principles. Radiant-heating floor panels are used to insure an even air temperature and a minimum flow of air currents, so as to avoid unnecessary dust and promote good glueing operations. Floor temperature is held at 75 degrees F.

To avoid drafts and air turbulence during cold weather, convection radiation was provided under all window areas. It consists of two continuous horizontal rows of finned pipe, one just under the sill, the other halfway up from the floor. Then in receiving and storage areas overhead blower-type unit heaters were installed as most suitable.

For cooling the plant in summer, the roof of the plant was built at dead level to hold about 2 inches of water. The flooded roof insulates the plant by reflection and cools itself by evaporation. Its effectiveness is gaged, after a year's try, by in-plant temperatures being maintained 8 to 10 degrees lower than outside shade temperature, benefiting both the worker and the product.

18 Insulation of hot machine surroundings has stabilized working conditions. Recent application of thermal insulation to steam drums, gas driers, and hot air exhaust ducts on the big five-color presses at Meredith Publishing Company, Des Moines, now insures a decent pressroom temperature. Employees are more comfortable, and are protected from burns. Heat is saved. Higher drying speeds are possible.

In summary, all operations in the pressroom have become stabilized and efficient.

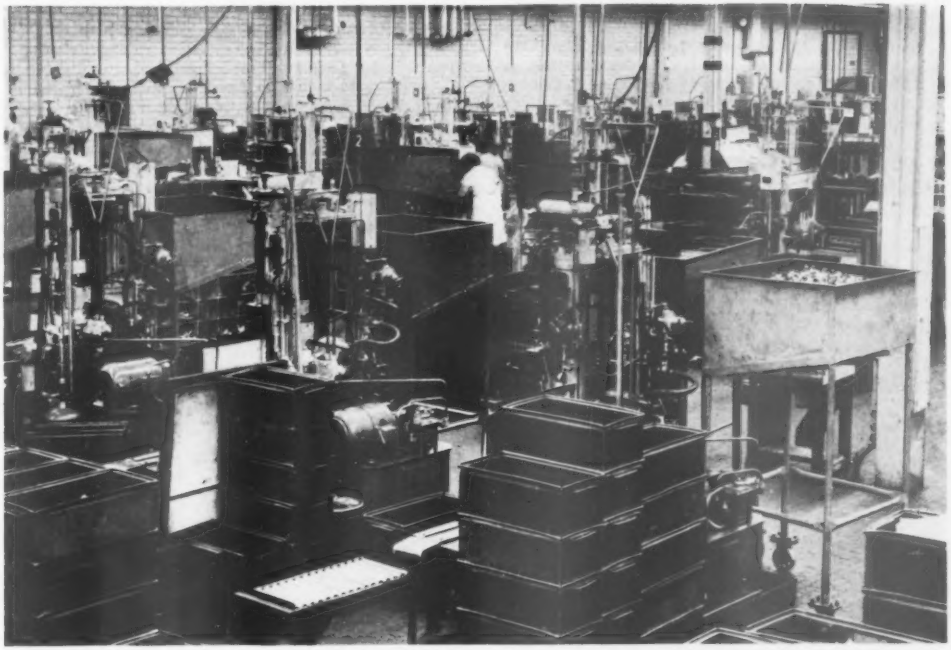


RADIANT HEATING at Perfection Nipple Company keeps even room temperature with no chill from the floor

19 Even room temperature throughout varying cold weather keeps employees comfortable. When the Perfection Nipple Co., Madison (Wis.), built its new one-story manufacturing plant a few years ago it chose underfloor radiant heating for the whole building. An area of 60x120 feet is involved.

The even temperature produced by this system over the entire area has been beneficial to all operations. A temperature of 65 degrees F. is maintained throughout wide outdoor-temperature variations in cold weather without any noticeable fluctuation in the shop temperature.

The 100-odd employees are enthusiastic about the even, comfortable temperature in which they work. Practically all operations require them to stand on the floor continuously. But there is never any chilling discomfort from a cold floor. Management claims these advantages definitely have some bearing on the continued record of high worker efficiency. True, it cannot measure the absolute gains from these advantages, but it knows they are there.



NOISE LEVEL in large open manufacturing area at Cleveland Graphite Bronze was effectively subdued by noise conditioning of the ceiling. Workers in any one area hear only sounds of local origin

20 Plant of 5½ acres under one roof eliminates distracting noises. When Cleveland Graphite Bronze Company, Cleveland, planned its present plant, it decided that noise elimination was a factor in creating the best possible working conditions.

From experience and observations in the old plant it drew the measures to eliminate as much noise as possible in the new one. In the old plant, which housed the same type of equipment used in the new one, the noise level during full operation constituted a continuous roar. Normal conversation was impossible.

Noise measurements ranged from 98 to 101 decibels at large punch presses, and from 75 to 80 decibels for shop lathes and similar equipment. Moreover, it was noticed that the pounding intermittent noises caused worker distraction and fatigue.

Accordingly, sound conditioning became an integral part of the new plant, which is a room 800 feet long by 300 feet wide. It was accomplished by treatment of the entire ceiling; noise-absorbent material was bonded to the concrete roof slabs at the time they were cast.

The heavy machines that caused the annoying intermittent noises were segregated at one end of the new plant. Thus most of the noise from this source was dampened out before it reached other areas. These machines were also set up on special mountings to minimize transmission of noise and vibration that formerly had been so annoying.

Although high noise levels close to noise sources cannot be eliminated, the old reverberating roar is gone. Workers hear only the sounds originating in their localized areas. As a whole, the company believes that the more comfortable noise level has helped to secure increased production and better quality.

21 Workers become less fatigued in noise-conditioned machine shop area. Management at Woodward Governor Company, Rockford, Ill., is quite convinced that the noise conditioning of its main machine floor area is an important contribution to worker satisfaction. It is sure that everybody who works in this shop goes home at night feeling much less fatigued and less nervously upset than he would otherwise. If that is so, less fatigue is reflected in higher worker efficiency in the long run.

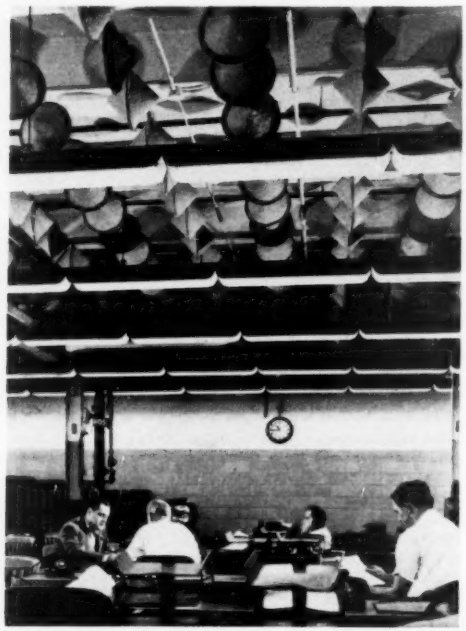
As an indirect proof of this conclusion, Woodward Governor finds that the physical condition of its 470 employees is good. Examinations last year showed 60 per cent to be above average, and only 8 per cent below average. Absenteeism in 1948 from illness was only 1.2 per cent.

Ordinarily the main machine floor could be an excessively noisy area. It contains 330 machines of just about every type used in a conventional machine shop, spread over a floor area of 36,000 square feet.

Noise reduction by ceiling treatment has kept down the noise level so well, however, that conversations may be carried on in an ordinary tone of voice. Supervisors don't have to shout instructions. It is not un-

common for an executive who is paged in the shop for a long-distance telephone call to answer at any one of the regular shop telephones without benefit of the booth enclosure usually needed in machine areas.

The company recognizes that its air conditioning system, providing clean air at even temperature, is a factor in keeping its employees healthy and efficient. But, although no scientific data are available to substantiate its belief, the company credits the noise conditioning in a large measure with the fine health record its employees have established since occupying this quieter area.



PAIRED CONES hung from ceilings of rooms at Sperry Gyroscope absorb excessive noise

22 Noise reduction pays off in better mental concentration and lessened fatigue. Paired cones of sound-absorbent material are answering the noise problems at Sperry Gyroscope Company, Inc., Lake Success, N. Y. They are suspended from ceilings in the procurement department, engineering dpartment, and several conference rooms.

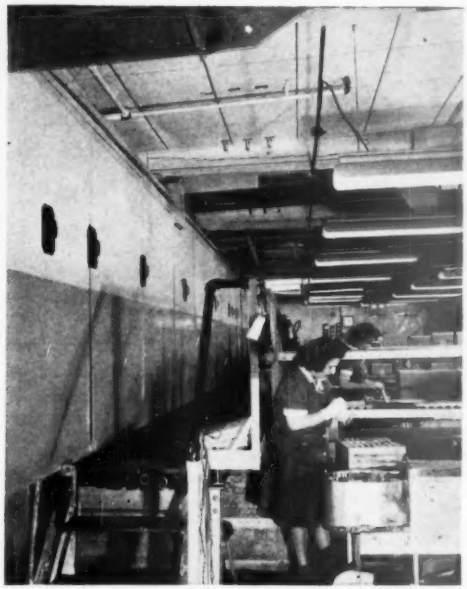
Fifty-six people and 50 telephones are located in the 3600-sq.ft. procurement department.

In the procurement department, where typewriters are busy, and where vendors and visitors are interviewed either in person or by telephone, the company believes the cones have paid for themselves in the eight months they have been used. Employees are relaxed and much less fatigued at the day's end. Costs of toll telephone calls have been reduced, too, because employees now have little difficulty in hearing their parties.

The choice of cones was largely governed by structural conditions. Because of the location of sprinkler pipes, conduits, heating units, and steam pipes, the customary acoustical ceilings seemed inadvisable. Cones were therefore selected. In one week end, parallel wires were strung at 2-ft. intervals and about 1 foot below ceiling level. The cones were hung from these wires on 3-ft. centers.

Cones are 15 inches in diameter, including a ¾-in. flange. Two cones are matched, flange to flange, and crimped together to form the complete unit. To get the best results, Sperry hung the cones in every other row facing one way. Cones in the alternate rows were turned 90 degrees so that flanges are perpendicular in adjoining rows. Since cones are hung above the level of the fluorescent fixtures, there is no direct interference with light.

In the engineering department, cones were installed in several sections. So well did they do the job of combating incidental noise that they have now been requisitioned for the rest of the department.



BAFFLE ALONG WALKWAY at Peerless Tube keeps intense punch press noise away from quiet adjacent area

23 Workers in both noisy and quieter areas get relief from noise conditioning partitions. Noise conditioning was installed at Peerless Tube Company, Bloomfield, N. J., as a definite help to employee morale and health. In the process of making metal collapsible tubes, a high noise level from punch presses and other machinery was annoying to all operators.

These punch presses are mounted lengthwise and along the center of the room. One side of the room contains production machinery. The quieter finishing processes are on the other side. But noise was reverberating over the entire area.

To reduce noise, a continuous row of removable sectional baffles of sound-absorbent material was

mounted from the ceiling to within a few feet of the floor on the quiet side of the punch presses. Ceilings of both areas were provided with noise reduction paneling. In so doing, the ceiling height was lowered for more effective noise reduction, also to decrease the air volume needed to insure good ventilation.

Further noise reduction was obtained in the punch press area by inserting vertical baffles, about 3 feet wide, at ceiling height across this half of the room between every third and fourth punch press. These baffles localized noise and reduce the noise level in each area.

It is now possible for all operators to enjoy the wired music from speaker outlets on both sides of the plant. The lower and brighter ceiling has improved lighting, and has helped insulate the working area from overhead ceiling heat caused by sun exposure. Workers in normally quiet areas are comparatively undisturbed by the sounds from inherently noisier areas.

GOOD WORKING CONDITIONS at Sapphire Hosiery included noise conditioning of knitting machine room

24 Noise reduction is paying for itself in greater employee comfort and well-being. Noise conditioning was considered a prime necessity by Sapphire Hosiery Corporation for the best operation of its Telford, Pa., plant. Management had learned that when all the knitting machines were running at full speed the resultant noise reverberated throughout the entire room. Its oppressive volume fatigued both male knitters and female help.

Therefore, when Sapphire built its new plant it applied noise reduction tile to the ceilings of all departments. Noise in the knitting room is now limited to an area close to its source. And it is possible to converse in a normal voice. The seaming room was likewise quieted down. It is much easier for supervisors to instruct operators, with the likelihood of orders being followed because they were heard clearly.

In short, the accomplished reduction in noise is much easier on everyone's nerves in an industry noted for tedious work. No longer is it necessary for operators to stop work frequently to get away from the noise for a while.

Vibration Control

25 Excessive vibration of shoe machines has been eliminated by vibration isolators. Vibration of shoe machines at Arad Shoe Manufacturing Company, New York City, used to bother the operators. The vibration was so severe it disturbed occupants of other floors in the building. Complaints of kidney disturbances and excessive fatigue by operators were frequent. Furthermore, operators could not accurately control the quality of their work.

One type of machine jolted the operators each time they punched out a leather sole. Another produced a fairly steady but heavy vibration. Both effects were annoying and unpleasant.

These conditions were effectively relieved by the installation of spring-mounted vibration isolators under each machine. Harmful shock and vibrations were entirely eliminated. Operators now suffer no more than ordinary fatigue. Quality of workmanship, too, was improved.

26 Severe drop-hammer shock and vibration has been cut down to nothing. Before the 2500-lb steam drop-hammer at Ohio Injector Company, Wadsworth, Ohio, was isolated on spring-type vibration dampening mounts and snubbers, the floor vibration from each hammer blow actually bounced the operator up on his toes. What this repeated shock meant in operator fatigue can well be imagined. Surrounding areas also were disturbed by the concussion.

After installing the hammer on a sub-level concrete foundation anchored on the mounts, no perceptible vibrations were felt on any surroundings. A dime balanced on edge on the adjacent floor was unmoved. Movement of the hammer on its new foundation was no greater than before. Hammer blow efficiency was improved, and hammer and foundation maintenance costs were noticeably reduced.

27 Press operator fatigue has been eliminated by vibration dampeners. Previously, workers at two 100-ton presses at A. Schrader's Sons, Brooklyn, N. Y., complained of tightening of leg muscles after a day's work at the presses.

Before isolation, these presses, were bolted directly to the concrete. Workers standing by the machines all day constantly absorbed shocks produced by the operations. Hence the tightening of the leg muscles.

Rubber-type vibration absorbers placed between the concrete and the footings of the presses now take up much of the jarring. Particularly, the impact shock caused by the punches hitting the work is no longer present. This shock was the main factor in operator fatigue.

In the press department of the company on the fourth floor the situation was somewhat different. There the workers on small punch presses were not affected, but those on the floor beneath were bothered by the vibration and noise. This constant jarring and noise caused discomfort for the employees and difficulty in maintaining work tolerances.

Vibration isolation has minimized the transmission of this vibration and noise through the floor. Similar applications were effective at other points in the plant in reducing annoying shock vibrations and accompanying noise.

How 1949 Plants Are Assuring

Employees are more efficient in these three plants. Why? Because they have excellent working conditions—good ventilation, good lighting, good dust control, and other equipment for their comfort

YALE & TOWNE, INC., Philadelphia

WHEN YALE & TOWNE BUILT its new plant in Philadelphia, the best possible working conditions were provided. High productivity in an atmosphere of fair and friendly human relations was the objective. For this reason, the company sought the newest and best in ventilating, lighting, and dust control equipment.

Plant ventilation. The heating and ventilation system is built around 76 blower-type unit heaters suspended from roof trusses in the manufacturing area of the 17-acre, single-story building. The system, in combination with glass-fiber-insulated roof, affords maximum flexibility and efficiency in both summer and winter operation.

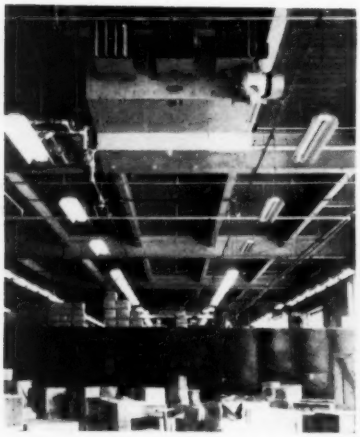
Unit heaters serve a dual purpose. They provide proper ventilation by supplying make-up air from the outside to replace air withdrawn from the plant by the process exhaust systems. They also furnish necessary heat for the manufacturing areas during the winter months. The system eliminates the need for long and cumbersome sheet-metal air ducts. And it requires far less motor horsepower than central-fan systems.

Each unit heater has an individual fresh air inlet above the roof. Also it may be adjusted to re-circulate air from the building. Each unit is driven by a 5-hp. motor, has a capacity of 13,500 cfm., and is equipped with "throw-away" air filters. Steam heating coils are of the nonfreeze type, and the fan wheels are dynamically balanced and mounted on self-aligning bearings. When the heaters are started, the fans run continuously. Heat output is regulated by thermostatically controlled steam valves on each unit.

Steam for heating the plant is generated by three two-drum boilers with underfeed stokers—two with capacities of 35,000 pounds per hour and one with a capacity of 14,000 pounds per hour. Steam is distributed at a pressure of 150 psi. to several reducing stations, where pressure is lowered to 15 psi. and delivered to the unit heaters. Condensate is returned to a feedwater heater by several pumps.

During normal manufacturing operations, there are many process exhaust systems from paint spray booths, shot blast and grinding rooms, and similar equipment. Also, there are a number of power ventilators on the roof over areas where there is an abundance of fumes or heat. When all these exhausts are in operation, they move approximately 450,000 cubic feet of air per minute.

When the unit heaters are started up for winter



GOOD VENTILATION is provided by unit heaters with adjustable vanes that direct air flow. View of roof shows, from left to right, intake for unit heater, process exhaust stack, and power ventilation

operation, their outside air dampers open approximately 25 per cent. Thereafter, the positioning of the dampers is controlled by pneumatically operated static pressure stations in three sections of the plant, which tend to keep a slight pressure in the building. This automatic regulator system results in substantial savings in fuel. The maximum quantity of outside air that can be handled in the winter is 50 per cent of their total capacity, or approximately 500,000 cfm.

In the summer the same units are used to circulate their entire capacity of 1,000,000 cfm. from the outside, resulting in a complete renewal of air every 15 minutes throughout the manufacturing area. To offset this excess supply of air being brought in, 46 additional power ventilators have been installed on the roof to run only in the summer months.

Plant lighting. Along with the heating and ventilation installations, Yale & Towne insisted on good illumination. To admit plenty of daylight, 36,300 square feet of "nonglare" windows were built into the plant. However, specific "seeing" tasks still required careful analysis to provide the proper lighting conditions.

The principal manufacturing area, which includes the machining, stores, service, and most of the assembly departments, lent itself to the exclusive use of fluorescent lamps. The flat roof had a clearance of 18 feet below the supporting steel. The bays measured 30x40 feet. Trolley duct was run on 10-ft. centers across the short dimensions of the bays. Luminaires for two 40-watt fluorescent lamps were suspended from and plugged into the duct.

Where a high light level was required, the luminaires were spaced on 5-ft. centers, which provided each bay with 24 luminaires in four rows of six luminaires each. This arrangement satisfied the basic requirements of good illumination—proper diffusion and direction, avoidance of shadows, and an adequate level of light free from variations. Where lower light levels were sufficient—as, for example, in bulk storage areas—the spacing of the fixtures was increased from 5 to 6, 7½, or 10 feet.

Such an installation has the advantage of being able to meet changes in lighting requirements in any area. In a matter of minutes, luminaires can be slid backward or forward on the trolley duct, or turned at any desired angle to the duct, to give the proper amount of light where it is needed.

The general pattern of fluorescent lighting was broken in one section of the building where the ceiling beam height is 24 feet. This is a 180x160-ft. area which includes structural fabrication, structural assembly, and industrial truck assembly departments, and part of the shipping department. The nature of the work done in these departments demanded that luminaires be placed as high as possible to give maximum clearance above the floor.

It was decided that the desired level of illumination could be obtained by employing in each bay either of two basic systems: (1) 25 fixtures, each containing two 40-watt fluorescent lamps; or (2) 4 combination fixtures, each containing one 400-watt mercury vapor lamp and one 500-watt incandescent lamp. Either system would provide approximately 40 foot-candles at floor level.

Consideration of incandescent lamps in conjunction with mercury lamps was indicated for two basic reasons. First, the incandescent lamps provide partial lighting during the warm-up period of the mercury lamps. Second, an approximation of daylight can be

FLUORESCENT LIGHTING in main manufacturing area gives high intensity at machine level. Fixtures are mounted on trolley duct, can easily be shifted to meet changes in lighting requirements

produced by mixing the blue-green mercury light and orange-yellow incandescent light.

The decision in favor of the mercury-incandescent combination, with its smaller number of fixtures, had the advantage of reducing overhead restrictions on the use of the floor area in this section of the building. Massive machines, fixtures, and assemblies could be placed almost anywhere without interfering with the servicing of the lighting fixtures. There was also less interference with overhead cranes, monorails, unit heaters, and exhaust systems.

The mercury-incandescent system has proved to be satisfactory. General lighting intensity is adequate for the work done in this section of the building. And, equally important, it is approved by employees working in the area.

Dust control. Another field of improved working conditions in the new plant is the control of dust that is caused by the finishing operations on welded frames.

In the old plant, outside welds were smoothed and burrs and rust were removed by hand grinding in whatever area was available. Resultant dust was unpleasant and unhealthful.

In the new plant, two adjoining rooms have been set up for this operation. Shot-blasting equipment in one room removes rust and most of the scale. The other room is for hand grinding of burrs, outside welds, and any heavy scale still present. Both rooms are furnished with complete dust removal facilities.

The grinding room is 28 feet square and 16 feet high, with a full-height, 18-foot doorway at one end. It contains special screens, which stand between workmen to prevent injury by flying particles. Alongside the grinding room is the airblast room, 20 feet square by 16 feet high.

A suction system has been installed on the roof to exhaust the dust from these two rooms. It has two multiple V-belt-driven, silent-vane fans capable of handling large volumes of air with minimum power requirements—in this case, 35.5 horsepower. These fans draw 50,000 cubic feet of dust-laden air from the two rooms every minute—and in such a manner that float dust is removed completely without creating an uncomfortable draft for the working men. The air flows longitudinally across each room into the piping system through a series of vertical outlets in the wall opposite the doorway, and is drawn up into the dust collector.

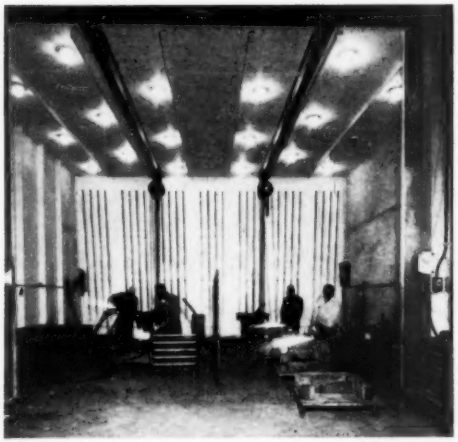
The dust collector is, in reality, two separate systems built into one large structure. One half serves the grinding room. The other half serves the shot-blast room. In this way, the dust systems may be used simultaneously or separately as desired. In each of the collectors, 6700 square feet of cloth screening filters the dust from the air.

At intervals, a rapping device shakes the dust free of the cloth screening, and the dust drops down into hoppers equipped with rotary discharge valves. These special valves permit unloading without interrupting the dust collection operations and are designed to function without any leakage of air. The hoppers empty into a spiral screw conveyor which carries the dust to a special storage hopper. The storage hopper has an automatic device which turns on a light when it is completely filled and ready to be emptied. The hopper is further equipped with a dust wetter; water piped to the storage bin is turned on, wets the dust, flushes the hopper, and makes unloading a clean and easy job.

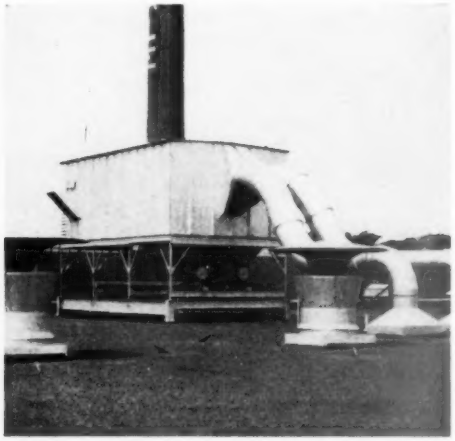
In both rooms, every effective device is employed for the comfort and protection of employees.

In every respect, these two rooms have been an unqualified success. The time required to finish frames has been reduced substantially by the use of the shot-blast operation as well as by the improved working conditions in the grinding room. Confinement and control of dust have made maintenance and plant housekeeping easier and less costly, and maximum comfort of employees has led to more efficient production.

Thus, it is evident that Yale & Towne executives have given major emphasis to good working conditions. They knew this was essential in their drive for a better product at lower cost.



DUST COLLECTION system serves grinding room and shot-blast room next door. Dust is drawn into



exhaust through vertical outlets in rear wall. Roof view (right) shows exhausts converging into collector

GULF OIL CORPORATION, Harmanville, Pa.

PROVIDE EMPLOYEES with good working conditions, and better workmanship and higher productivity will result. That is the policy Gulf Oil Corporation followed in equipping the new machine shop of its Harmanville, Pa., research laboratories.

This shop meets all the vastly diversified metalworking needs of the laboratories' staff members. It also produces most of the parts Gulf requires for geophysical prospecting equipment. Therefore, quick service and superior workmanship are key requirements on all jobs.

The machine shop is a single-story steel-frame structure with a monitor roof. It has 18,479 square feet of floor space. The main shop and assembly floor occupy 10,676 square feet as one open area, while storage space in the basement and mezzanine takes slightly more than 2500 square feet. Supervisory offices, wash and locker rooms, and separate "special-purpose" shops for grinding, electroplating, sheet welding, painting, stockroom, and inspection occupy the remainder.

To give shop employees the most efficient place in which to work, many physical conveniences were included in the layout.

AIR CONDITIONED inspection room is maintained at constant temperature of 68 degrees F. Room is fully equipped with modern gaging instruments, has vestibule and two sealed doors

Ventilation and heating. Good ventilation was a major objective. The assembly area, sheet metal and welding room, and locker and washrooms are served by exhaust fans. The main machine area is naturally ventilated through adjustable monitor windows. There is a blower vent system in the electroplating room and a hood for removal of soldering fumes adjacent to the welding room. Tempered air is supplied to the grinding and paint rooms to replace that exhausted through hoods. The atmosphere in the spray painting booth is kept clean by a water curtain. Special air conditioning keeps inspection room temperature at 68 degrees F. This room is equipped with a vestibule and two sealed doors, which simplify the job of maintaining constant temperature.

Steam heat for the shop is supplied from a central plant and is controlled thermostatically in individual areas. The main machine area, individual shops, and offices are heated by convector radiators along the walls and by steel-finned radiators under the monitor. Both types have their vents directed toward the ceiling to keep the heat even and prevent blasts of hot air directly on the workmen.

Unit heaters serve the locker room, washrooms, and basement storage rooms.

Lighting. To provide good over-all light, windows in the shop rise from bench level to the ceiling and fill the full height of the monitor section. To avoid sun glare and summer heat, all workbenches were

WINDOWS AND FLUORESCENT LIGHTING combine to give optimum illumination in machine shop. **Workbenches located along north wall at left receive best natural light, with minimum of sun glare**

placed along the wall on the shady north side of the building. Offices and shops along the south wall are partitioned with clear glass set in metal framework, to prevent cutting off natural light from that side of the building. Outside windows in the offices and the main shop area have aluminum venetian blinds.

Ample artificial illumination is provided by fluorescent fixtures arranged in uniformly spaced rows parallel to the main axis of the building. This system gives an average intensity of 35-50 foot-candles at the machines. Individual machine lamps supplement the overhead fixtures. At benches and in offices, 50-75 foot-candles are provided.

Painting and plating rooms are equipped with incandescent lamps in explosion-proof fixtures.

SOUNDPROOFING of sheet metal and welding room holds down noise level on main floor

Color. Color also was utilized to obtain the greatest visual efficiency and to aid light concentration. Light green is the base color of side walls and ceilings, while doors and trim are dark green. End walls and accident hazards, including the overhead crane, are painted bright yellow. Machine bases are light gray. Cream color is used on moving machine parts and operating control areas.

Noise conditioning. To prevent noise distraction, sheet metal and welding operations were confined in a tile-walled shop off the main floor, with double sheet-metal doors and a noise-absorbent ceiling. Similar noise conditioning was applied in the grinding room (which is partitioned off from the main floor), inspection room, and all offices.

Floors in the main machine area are of maple, edge grain, to help noise reduction, also for foot ease. The plating room is floored in unglazed, ceramic tile; stockroom in end-grain fir blocks; paint room and welding room in concrete; and offices in asphalt tile.

Other features. The machining area is broken down into three similarly equipped operating units. As a result, machinists need take only a few steps from their benches to any machine they may have to use. The tool cage is located in the center of the main area, and is only 5 feet high, to permit a clear floor view. Each machine has plenty of space around it, so that no worker is crowded. All supervisory offices are linked by an intercommunication system.

These, in the main, are the facilities that help craftsmen turn out exacting work with high efficiency.

H. S. CROCKER, INC., San Bruno, Calif.

ATTRACTIVE ENTRANCE suggests pleasant surroundings inside

COMBINATION LIGHTING by mercury vapor and incandescent lamps hung 20 feet off floor provides 30 foot-candle intensity at working level

ADVICE OF WORKERS THEMSELVES was sought and followed in estabishing ideal working conditions at the new H. S. Crocker, Inc., printing plant. Many of the conveniences and techniques now operative are the outgrowth of suggestions that were made by employees of the plant.

The $2,000,000, one-story plant is located on an 11-acre tract of level land adjacent to rail, highway, and air transportation. Facing east and west, the building is 400 feet long by 300 feet wide, with a mezzanine floor for executive offices and balcony space for additional storage area. Working comfort of the 300 employees is stressed throughout.

Lighting. Two continuous rows of RLM dome and industrial fluorescent units 12 feet off the floor provide 50 foot-candles of illumination for the work on presses. The color of this high-intensity light simulates daylight as closely as possible to aid work requiring color discrimination. Typesetting, cutting, punching, and other areas not needing such high intensity are illuminated with a combination of 400-watt mercury vapor and 1000-watt incandescent lamps. Hung 20 feet off the floor, they give a 30 foot-candle intensity at working level. General lighting in the warehouse area is provided by standard dome, RLM reflector units mounted from 18 to 20 feet off the floor—average intensity, 10 foot-candles.

Artists and color correctors have their own studios on the north side of the plant, where they get the best natural light.

The sum total of lighting engineering in the building presents a real achievement in ideal illumination.

Color scheme. Harmonizing with the lighting effect, the color scheme results in a restful and eye-appealing working area. The interior of the plant is painted in off-white and gray-green. Ceiling and walls are off-white, and partitions gray-green. Offices are finished in natural oak and green.

Noise conditioning. Every effort has been made to keep the big plant as quiet and vibration-free as possible. Presses are mounted on individual concrete blocks which are made even more shock absorbent by the use of wood, lead, or felt material. As a result, there is no noticeable shaking even when the big, four-color presses are in operation.

Noise reduction was not necessary for the main floor. Press noise even during full operation does not build up in the large open area, and there is actually a low decibel level.

Lobby, offices, and clerical departments on the mezzanine floor are all noise conditioned with sound-absorbent material.

Heating and ventilation. An overhead, hot-air, duct system maintains 65- to 70-deg. temperatures throughout the plant during the winter months.

Since the building is located in an area where annual temperature variations average less than 30 degrees, there is no need for over-all humidity control or air cooling. However, partial air conditioning provides a continuous flow of temperature-controlled and filtered air in the main plant area.

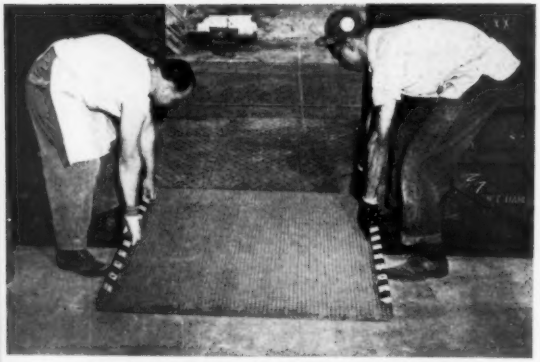
Only in the photo composing room is complete conditioning necessary. Here temperature and humidity are kept constant.

Vacuum suction is used to "air condition" etching sinks. Acid fumes are drawn down, and out, by a suction system beneath each sink.

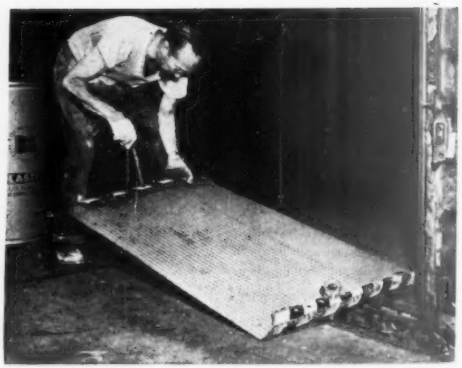
Suction is also used in the web press department. Connected to each press is a 6-in.-diameter pipe. Instead of piling up on the floor, waste cuttings from the presses feed into these pipes, and the vacuum carries them outside the plant for disposal.

Good working conditions such as these have encouraged Crocker employees to work efficiently. They are proud of the workplace they helped create by their interest and suggestions.

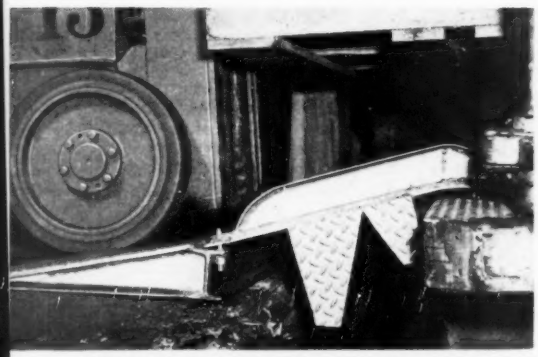
Modernization of Bridge Plates



LIGHT DUTY. Hand truck steel plate. Design of curb simplifies handling and prevents run-offs
Capacity: 2000 pounds. Weight: 112 pounds



LIGHT DUTY. General-purpose steel plate. Pins in curbs prevent shifting of plate during use
Capacity: 2000 pounds. Weight: 70 pounds



MEDIUM DUTY. Two-piece magnesium combination plate. For overcoming elevation differences
Capacity: 4800-lb. axle load. Weight: 120 pounds

MEDIUM DUTY. Magnesium plate. For relatively short gaps. Lugs at ends hold plate firm
Capacity: 6000 pounds. Weight: 60 pounds

HEAVY DUTY. Steel plate. Two-piece chain lifts are readily assembled, removed when plate is used
Capacity: 15,000 pounds. Weight: 600 pounds

HEAVY DUTY. Steel plate. Forks inserted in lugs without second man or driver leaving truck
Capacity: 15,000 pounds. Weight: 550 pounds

Improves Materials Handling

Monsanto's careful survey of platforms and carriers turned up a fist-full of facts that will guide others to a solution of their bridge-plate problems

R. M. AUDE • GENERAL SUPERINTENDENT, TRANSPORTATION AND MATERIALS DEPARTMENT, PLASTICS DIVISION, MONSANTO CHEMICAL COMPANY, SPRINGFIELD, MASS.

FOLLOWING A SURVEY of our requirements, the Plastics Division recently purchased 33 scientifically designed bridge plates of six different types to replace the flat steel plates previously used for bridging the gap between platforms and carriers during loading and unloading operations.

The advantages of this new installation are difficult to measure in terms of dollars and cents. They represent principally the elimination of what we consider to be six hazardous aspects of flat steel plates usually used for the purpose:

1. Flat steel plates are heavy and awkward to handle, presenting such hazards as back strain and crushed fingers.

2. They are often too small for easy movement of fork truck equipment into and out of carriers.

3. Usually, flat steel plates are smooth, and therefore slippery, during foul weather.

4. The absence of a raised edge requires that care be used with fork truck equipment, lest wheels run off the plate.

5. Since flat steel plates are not equipped with locking devices, they must be used without being locked in position or they must be secured by nailing the car end to the floor of the car. If the plates are not locked in position they may slip and cause injury to personnel and/or damage to equipment. Nailing the plates to the floor of the car is not considered satisfactory because nails become loose; also, they are usually left in the car, presenting accident hazards.

6. If the difference in elevation between the carrier floor and the platform is more than 2 or 3 inches, flat steel plates are unsatisfactory because they rock up and down, become deformed, and are forced out of position.

While we felt certain that these disadvantages could be overcome, we knew that just "any" bridge plate would not produce the desired results. The result was the survey already mentioned, and bridge plates specifically designed for our operations.

The factors taken into consideration in this survey are listed below, together with a summary of the information developed which might have application outside of our own operations.

1. Type of handling equipment to be used on bridge plates. Heavy-duty bridge plates (capacity 15,000 pounds) will support the weight of a loaded fork truck. Medium-duty bridge plates (capacity 6000 pounds) will support the weight of loaded hand pallet lift trucks of either manual or motor-driven type. Light-duty bridge plates will support the weight of most loaded hand trucks.

2. Floor height of carrier involved (and, in the case of freight cars, width of the car). Floor heights of semi-trailers which enter the plant were found to vary over a wide range, with the most common height about 52 inches. The floor height of company-owned highway trucks is about 44 inches. For information on freight cars, we relied upon a survey recently made by the Standard Oil Company. Average height of car floors above the top of the rails was found to be 43.8 inches, with extreme variations of minus 6 inches and plus 7 inches. Of all cars, 94 per cent fell within plus or minus 3 inches of the average. With regard to car width, the narrowest cars, from sill to sill, measure 9 feet, 1 inch, and the widest 11 feet, 3½ inches. Of all cars, 96.7 per cent are between 9 feet, 4 inches and 10 feet, 4 inches wide. With this information, plus a knowledge of the distance from the edge of the platform to the center of the rails, it is a matter of simple mathematics to determine the gap which the plate must bridge.

3. Height of platform. The difference in height between the platform and the vehicle floor is of prime importance. The greater this difference, the longer the bridge plate must be to give a minimum slope. With a single exception, platforms here at the Plastics Division were found to be approximately 44 inches—suitable for plant trucks, but about 8 inches too low for semi-trailers. Wherever semi-trailers were to be loaded, therefore, we found it necessary to use long bridge plates rather than short ones, which would have been adequate for trucks alone.

4. Weight of bridge plates. Although heavy-duty steel bridge plates weigh several hundred pounds, most are so constructed that they can be transported and placed in position with a fork truck. Most light-duty bridge plates, even of steel construction, are light enough to be carried and placed in position manually. Medium-duty steel bridge plates weigh approximately 200 pounds, hence it was decided that for our particular purpose medium-duty bridge plates made of magnesium should be purchased. These plates have a capacity of 6000 pounds, yet most sizes weigh less than 100 pounds. We felt that this light weight, making for ease in handling, would justify the additional cost per plate.

The new bridge plates have not, by themselves, brought any revolutionary advance in the efficiency of our materials handling here at the Plastics Division. They have, however, been a very definite factor in our over-all improvement of more than 260 per cent in the past two and a half years in the number of pounds per man-hour handled by our consolidated materials handling departments.

How We Get the Most Out of Industrial Training Aids

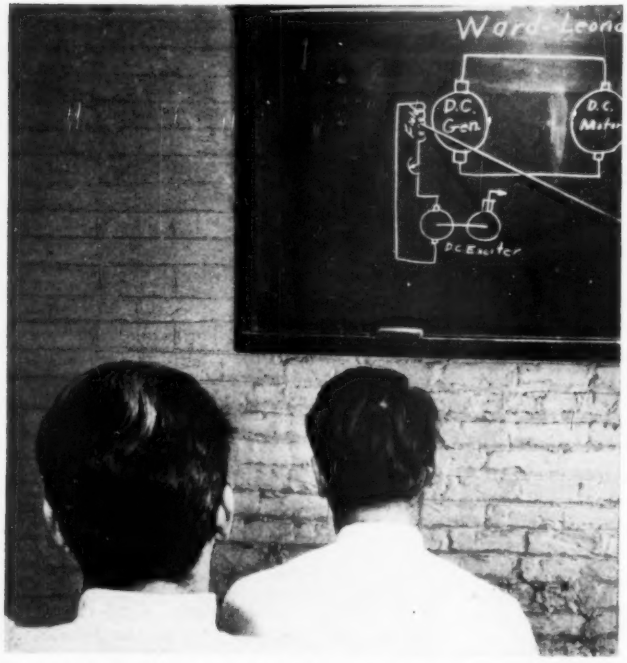
- Blackboard sketches supplement oral instruction
- Slides and movies simplify technical subjects
- Enlarged photographs, photostats explain details
- Special charts fit particular class needs
- Static and dynamic models hold class interest

W. C. VAN CLEAF • DIRECTOR OF INDUSTRIAL RELATIONS, THE ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE

INDUSTRIAL TRAINING PROGRAMS post two problems unique in the field of education. When a salary is paid to students attending classes, the cost of training builds up at a startling rate. Also, the qualifications of instructors are usually set in terms of competence in specialized fields of knowledge and experience rather than teaching ability.

Both of these problems make the use of good training aids an important part of the industrial training job. Because they can be excellent short-cuts to mastery of complex subjects, training aids save both time and money where students are paid to go to school. In addition, such aids help the less skilled teacher to put across his ideas more clearly and with better organization.

In the majority of cases, properly selected training aids can be justified on a cash basis through improvements in efficiency of instruction. Often, in fact, they pay for themselves during the first application. Such results don't come about automatically, however. To be effective, training aids must be carefully selected and properly used to meet specific classroom needs. Here are some suggestions, based on experience with the Allis-Chalmers training program for graduate engineers, on how to meet these requirements in the case of eight common training aids.



BLACKBOARD SKETCHES ARE GOOD, BUT ARE TIME CONSUMING AND COSTLY

1. Blackboard sketches. Blackboards are almost universal classroom equipment. As such, they are widely used, and misused. Many mechanisms and principles are certainly more easily understood if the instructor supplements his description with an illustration. The thoughtful instructor will prepare such illustrations ahead of time and keep them covered until needed. Unfortunately, few instructors seem to be thoughtful. At any rate, they rarely prepare in advance, and have to interrupt explanations while illustrations are prepared, thus wasting costly minutes. Or, worse yet, some teachers keep on talking while drawing on the blackboard — a practice that notably reduces the effectiveness of instruction. And some even manage to face the blackboard in such a way that they cover up whatever they are writing.

At first glance it would appear that the blackboard is an inexpensive way to illustrate instruction. If properly and sparingly used, this is probably true. However, in industrial instruction, where classroom time may easily cost $100 an hour, there are other training aids that are far more efficient.

2. Lantern slides. Photographs tabulations, complicated diagrams, and even portraits can be reduced to easy-to-carry glass covered positive transparencies at a very nominal cost. With a suitable projector, these slides can be readily shown to large groups.

Theoretically, the slide is the training aid that instructors covet. Slides are small, packing a lot of information into a little space. They can be changed rapidly, so the instructor can talk rapidly, without waiting for new materials. Many items not suitable for blackboard illustration can be shown with ease with slides.

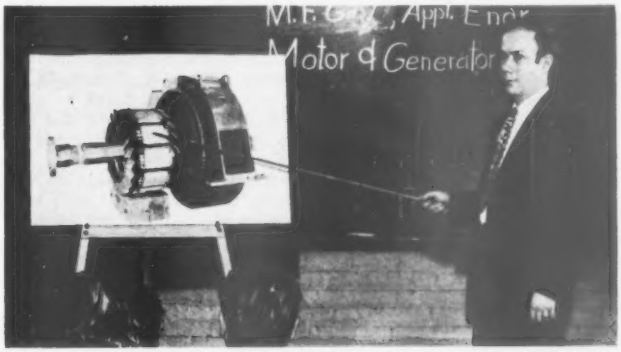
In spite of all these advantages, slides are limited in their usefulness. A half-dozen slides, for example, are excellent to supplement other types of training aids. Only the most skilled teachers, however, are able to instruct from slides for appreciable lengths of time. This requires careful planning of the presentation, and the use of "eye-openers" at regular intervals in a long series. Under such conditions, the skilled instructor also has the lights turned on when answering questions or talking at length.

The major disadvantage of slides is that they are used in a darkened room. If the presentation is long, and if the instructor goes into much detail, the class becomes inattentive, and some members may even go to sleep. Worst of all, the darkness keeps the teacher from seeing his class.

3. Motion pictures. Thousands of 16-millimeter training films are available on almost as many subjects. They help to bring real life into the classroom, and they are often of great value in explaining complicated operations quickly and effectively.

Movies on general subjects are readily available. But it is often a hard job to find appropriate pictures to supplement specific discussions of technical subjects. Usually, the instructor must view a discouraging number of films before he can find one that is suitable for his purpose. Another difficulty is that the production of movies is usually outside the instructor's scope.

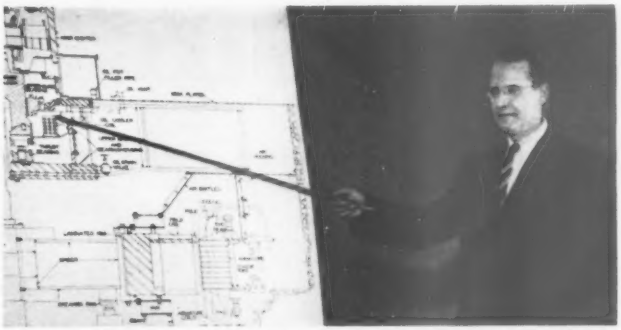
Successful teaching hinges on a nice balance between instructor and student participation. Obviously a motion picture does not afford student participation. When the point is reached where the students get a continuous diet of movies with no instruction to supplement and tie it all together, the course is well along toward complete deterioration. A motion picture should always be introduced and supplemented by an instructor who has previewed the presentation and carefully prepared his own discussion accordingly.



ENLARGED PHOTOGRAPH PERMITS DETAIL VIEWING BY CLASS OF 20 OR MORE

4. Enlarged photographs. Enlarged photographs have turned out to be particularly successful training aids at Allis-Chalmers. They have most of the advantages of slides, in that considerable detail can be shown. Furthermore, the instructor is in a well-lighted room where he can watch the class for signs that the material is not being understood.

A 20x26-inch enlargement is adequate for a class of 20 to 30 students. Mounted on ⅛-inch Masonite, such an enlargement will cost about $5.50. This is quite reasonable, compared to the training value of the enlargements, or even compared with the cost of slides when the superiority of enlargements is taken into account. The one disadvantage is that they require more space for storage than lantern slides.



OVERSIZE PHOTOSTATS ARE INEXPENSIVE BUT REQUIRE GOOD ILLUMINATION

5. Enlarged photostats. Sketches can be photostated and enlarged at little expense. This is true of instructor-prepared sketches as well as material taken from printed literature. Experience has shown that 23 x 30-inch photostats are the best for classes of 20 to 30 students. Occasionally a larger size will be required to enable the teacher to describe details of a large machine, such as a waterwheel generator.

One of the few disadvantages of photostats is the fact that the lines in an illustration do not always enlarge in the desired proportions. For this reason, specially prepared charts and diagrams are now being developed for the Allis-Chalmers graduate training course.

Continued on next page

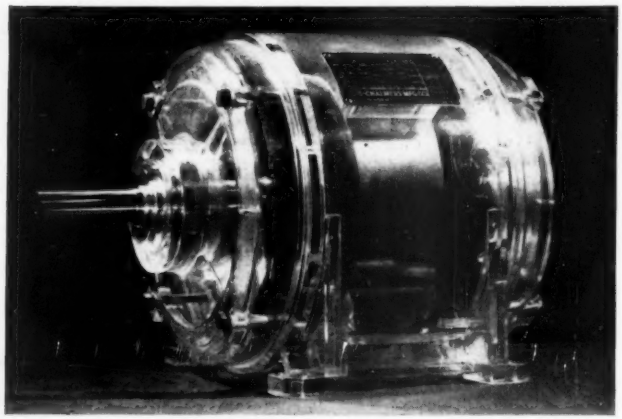
6. Specially prepared charts. These turned out to be ideal training aids. They were adopted because it was finally decided that the costliness of classroom time justified the expense of uniform charts specifically designed to fit course needs and to improve teaching efficiency. Accordingly, several draftsmen were trained in chart preparation, and soon became proficient. As a result, it is now possible to obtain charts produced directly from instructors' rough sketches. This is particularly advantageous because it is difficult to get teachers to divert their attention from regular work long enough to prepare training aids.

The size of special charts was set at 28 x 44 inches, the standard size of show-card cardboard stock. The storage problem has been solved by making an inexpensive chart box.

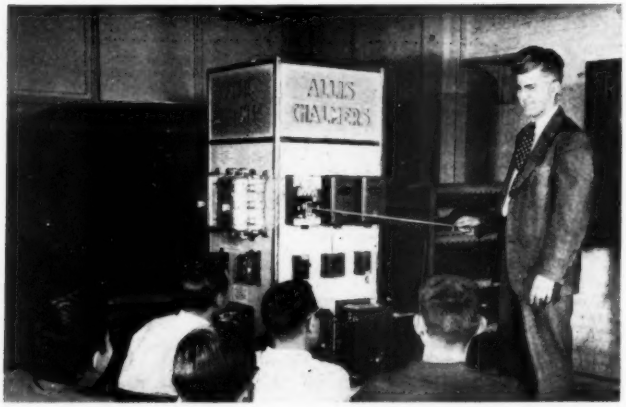
Coloring parts of diagrams helps the instructor in citing key parts. Cross hatching and shading also make drawings easier to understand. These techniques are commonly used. With their help, the charts have been found to be of real value to instructors. The pace of discussions is brisk, the classroom remains well lighted, the instructor can often dispense with notes, and the classes seem more attentive.

7. Static models. When an instructor talks about a device, the students receive third-degree stimulus. When a picture of the device is shown, second-degree stimulus is received. But when the instructor shows the device itself, or a model of it, the students receive first-degree stimulation. Things seen and felt are better remembered than things just heard about. This is the success secret of all types of models.

The best type, of course, is the dynamic model. But where the expense is too great, static models are often valuable substitutes. The resourceful instructor can extract maximum educational value out of such models by using them as the climax to carefully built up presentations. It is possible to hold the attention of a class for a long time with only a simple gadget. We've proved this many times over.



STATIC MODEL IN A TRANSPARENT CASE IS ALWAYS AN ATTENTION GETTER



WORKING MODEL CUTS EXPLANATION TIME SHARPLY, THEREBY CUTS COSTS

8. Dynamic models. The dynamic model is probably the acme of training aids. Here the instructor is after big stakes in the way of timesaving, and reasonable costs can easily be justified. For example, a motor-generator set, used to explain the Ward Leonard speed control, saves about $80 every time it is used. A theory that formerly took 1½ hours to explain can now be put across in 15 minutes. Furthermore, the material is better remembered because the students who take the course have actually seen "the wheels go round," and have seen the speed of the motor change as they adjusted the generator rheostat.

The model of the Ward Leonard speed control was built from tractor generators, rheostats, and meters, ordered from a radio supply house, and a ¼-horsepower motor bought from a mail order house. It was assembled by students in a training program. The set just about pays for itself every time it is used.

Working models need not be elaborate or expensive to be effective. In fact, the simpler they are, the better. The big problem is to find the initiative and time for designing and building models. If students are available, such as shop apprentices, it may be easy to get the job done. Sometimes working models can be built by a local firm which specializes in such work. Regardless of the method, however, no model will be effective unless it is carefully planned to meet some specific and important teaching need.

How to Make Layoffs and Retain Good Will

Someone's always hurt when layoffs have to be made. You can't change that. But here's how you can ease the pain for yourself and those due to be laid off

HOW TO HANDLE LAYOFFS with the least hurt to all concerned is a perennial problem. Recognizing this, the Stamford-Greenwich (Conn.) Manufacturers' Council has developed an unusually helpful guide for employers. Written by Donald H. Jensen of the council's public relations committee, the guide has been used successfully by many council members. Because of its general interest, it is reproduced below for the guidance of FACTORY's readers.

There are five things that management should do:

1. Brief supervision. Once top management has decided a layoff is necessary—and has carefully reviewed all of the factors involved—supervision down the line should be thoroughly briefed (by the top executive officer wherever practical). Having the facts promptly, supervision is able intelligently to combat exaggerated reports in the shop. And, too, the mental attitude is healthy when supervisors know they won't have to depend on rumor, the unions, or the press.

2. Brief unions. Next, shop stewards and all other appropriate union people should be given an honest, factual picture of the situation (this assignment should normally be the job of the industrial relations director or the person who usually represents management). If the unions are informed early, they are encouraged to cooperate with management in handling the situation. And they are not inclined to minimize management concern with the need for such action.

3. Brief employees. Based on what internal communication media have proved effective in the past, all employees should be completely informed on the extent of the present layoff, all contributing causes for the move, and a frank appraisal of the immediate future and the long-range picture. By knowing the truth, employees can appreciate the difficult decision with which the company is faced. And they then have little reason not to be factual in word-of-mouth reporting to the community.

4. Evaluate public interest. The extent of the layoff in relation to total personnel, a self-analysis of the interest of the community in the company, and the extent of previous or subsequent layoffs, are three key factors to guide a company's chief executive officer on whether or not to prepare a press release (or hold a press conference). But under no circumstances should a company be evasive when a newspaper—either on its own initiative or as a follow-up on a press release—calls for information. Nor should evasion be practiced when business, civic, or religious leaders show concern.

Having a "good press" is a most effective way to minimize rumor development. And enjoying the confidence of the newspapers is the best way to prevent irresponsible attacks on the company.

5. Organize termination interviews. Each and every employee affected by a layoff should have an opportunity for a personal interview with a sympathetic and helpful member of the personnel department (or the top executive officer himself in the very small companies). The personnel department representative should cover the following topics:

a. A discussion of each individual's secondary skills for the possibility of present or future reassignment in departments where jobs are available. Where a shop is organized, this procedure must first be ironed out with the union.

b. A review of job possibilities in the community with personal interviews with other companies arranged where possible. A list of local employment agencies may be prepared and suggestions given for the insertion of inexpensive help wanted classified ads (in some cases the company can earn good will by sponsoring large ads in the newspapers, listing the skills of the employees to be laid off).

c. An explanation of the services of the state employment office (here sample forms may be used), advising prompt registration.

d. An assurance that all money due (salary, credit union savings, vacation allowance, bonus compensation, and dismissal pay, where each applies) will be paid promptly.

e. A discussion of steps to take in order to keep up group insurance policies and hospital plans (wherever this is practical).

f. An assurance that prompt attention will be given to inquiries concerning a person's qualifications and that advance references are available on request.

g. A brief summary (as a follow-up to the company's original explanation of the move) as to the reasons for the layoff and an offer to clear up any questions that may still remain in a person's mind.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 152) . . . a summary of **LABOR DEVELOPMENTS** (page 246) . . . things **YOU WANT TO KNOW** more about (page 238)

What the Factory

About Pay, Profits, Prices, Speedup

This survey can help you direct your worker-information program

It shows that the worker has plenty of economic horse-sense, but lacks specific information which only management can give him

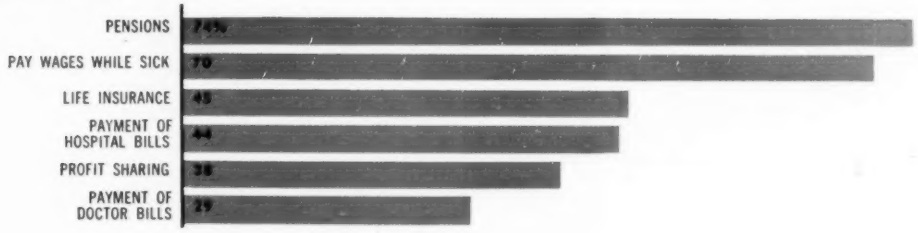
Some managements are doing the job. This survey makes that plain

But too many managements are not. The survey proves that, too

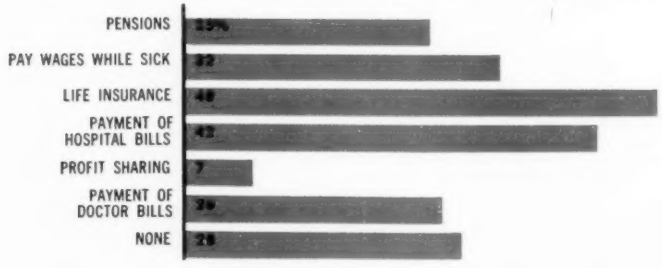
So try the questions in your own shop. Then go ahead and tell your workers the things they really need to know

1 · FRINGE PAY

Here are some of the things some companies are providing for workers. Regardless of which ones your company may be doing for you now, which three would you most like your company to do?



Now tell me, which of these things is your company already providing for you?



Worker Really Thinks

THIS IS THE FIRST OF TWO ARTICLES based on FACTORY's Sixth Annual Survey of Worker Opinion. The second article will be published in the November issue.

The survey was made for FACTORY by the McGraw-Hill Research Department. Interviews were conducted in 34 states, containing 97% of the factory workers in the United States. Interviews were allotted in proportion to geographical concentration of manufacturing workers, type of industry, size of plant, union affiliation (or lack of it), age group, and sex. Only factory workers below the supervisory level were interviewed.

Sample size and the accuracy with which the distribution of the sample reflects the distribution of all factory workers determine the possible error in results reported. Every reasonable step was taken to insure proper distribution. Size of the sample is such that the odds are 50 to 1 against a statistical error of more than plus or minus 3%.

Replies to all questions were tabulated for each of the following "worker groups":

By union affiliation: Nonunion workers; all union members; CIO members; AFL members; independent union members.

By size of plant: Under 100 employees; 101-250 employees; 251-500 employees; over 500 employees.

By age of worker: 20-34 years; 35-54 years; 55 up.

By geographical location: New England (*Conn., Me., Mass., N. H., R. I., Vt.*); Middle Atlantic (*N. J., N. Y., Pa.*); East-North-Central (*Ill., Ind., Mich., Ohio, Wis.*); South (*Ala., Ark., Del., Fla., Ga., Ky., La., Md., Miss., N. C., Okla., S. C., Tenn., Tex., Va., W. Va.*); West (*Ariz., Calif., Colo, Iowa, Idaho, Kan., Minn., Mo., Mont., Neb., N. M., Nev., N. D., Ore., S. D., Utah, Wash., Wyo.*)

WHAT THIS MEANS:

The worker puts pensions at the top of the list of "fringe benefits" he wants. But pensions are well down on the list of the benefits he says he's getting.

IF YOU WANT PROOF that unions have a hot issue in pensions, here it is. Here, too, is a warning of demands-to-come for firms without a paid sick-leave policy.

Cross-tabulation of the worker's statement of what he wants and what he is getting discloses a somewhat surprising fact. The worker is not likely to receive a particular benefit just because he expresses a preference for it. For example, among workers who want pensions, the percentage receiving pensions is not significantly greater than the percentage of all workers receiving pensions. The same thing is true with regard to the other five "benefits." This seems to indicate that, to date, management has not given recognition to workers' preferences.

Analysis of responses by all worker groups shows little variation in the expressed desire for any particular benefit. When it comes to benefits the worker is actually getting, however, there are marked variations on all items except profit-sharing plans. The percentage of workers in the New England States receiving every one of the benefits listed exceeds the percentage in any other region. Only 14% of New Englanders receive no benefits, compared with 26% or more for workers in other regions (average, all workers, 28%).

By plant size, the low figure on each item was recorded by workers in plants with less than 100 employees: 48% of such workers receive no benefits. Except for pensions, CIO members are more likely than AFL members to receive any given benefit. The difference, however, is not great. Nonunion workers and AFL members score about the same.

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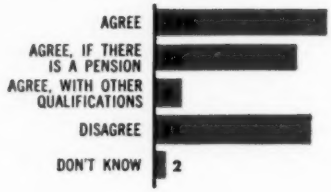
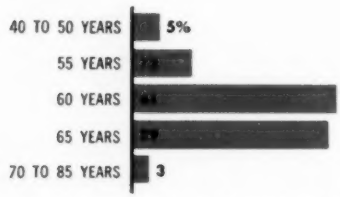
2 · PENSIONS

Some companies require workers to retire or quit work when they reach a certain age. In general, do you agree or disagree with such a policy?

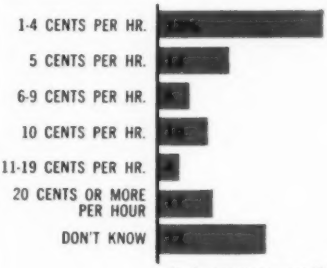


At what age should workers be required to retire?*



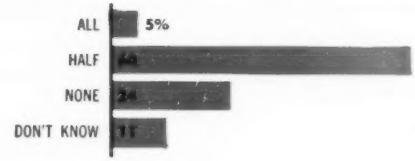
* Asked only of workers who agreed, with or without qualification, to policy of mandatory retirement. A few workers mentioned ages not divisible by five; for simplicity of presentation, such replies were tabulated with the age group of the nearest five years.

Some workers want to retire at 65 and receive a pension of $100 each month from the company. How much do you think such a pension would cost, in cents per hour per employee?*



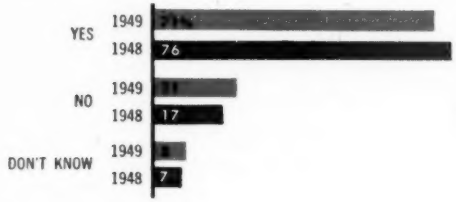
* Most answers were specific figures, with 5 cents and 10 cents predominating. Other answers have been grouped in significant ranges for easy interpretation.

What part of this do you think the worker should pay — all, half, or none?

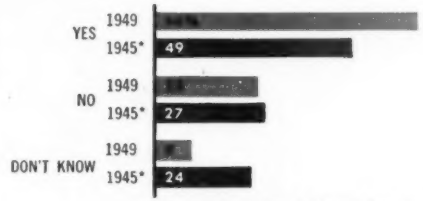


3 · WAGE RATES

Would you like to have your wages go up and down as the cost of living goes up and down?



If it turns out that jobs are scarce in the next couple of years, would you be willing to work for less per hour than you did this past year?*



* In 1945, the wording of this question was as follows: "If it turns out that jobs are scarce during peacetime, would you be willing to work for less per hour than you did during the war?" The 24% "don't know" answers included 19% qualified answers.

WHAT THIS MEANS:

The worker favors automatic retirement—if there is a pension. He thinks 60 or 65 is the best retirement age. But he doesn't realize how much pensions cost. That may be why he says he is willing to pay half the cost.

OF MAJOR IMPORTANCE here is the worker's strong belief that he should share pension costs on at least a 50-50 basis with his employer. Almost two out of three workers (65%) took this position. By so doing, they disagree sharply with the conclusions of the President's Fact-Finding Board in the steel dispute. They also disagree with Philip Murray and other union leaders who are currently defending the Board's recommendation that pensions for steel should be paid *wholly* by the employers. The survey results certainly support the argument that the average worker is not personally sold on the philosophy of "something for nothing."

How much the worker would be willing to pay for pensions is another matter. You can't get a precise measure from the figures at hand. But you can safely guess that he will want to think twice about 50-50 sharing where he finds pension costs much higher than he thought they would be.

Age, not unexpectedly, makes a difference in the way the worker feels about mandatory retirement:

Age	20-34	35-54	55 up
Agree, unqualified	39%	32%	27%
Agree, pension	29%	28%	27%
Agree, other qualifications	4%	5%	4%
Disagree	26%	32%	41%
Don't know	2%	3%	1%

The tabulation of the answers to this question made by workers who are already working for companies with established pension plans discloses only minor variations from the replies of workers in general.

Retirement at 60 or 65 years seems to be pretty well fixed in the worker's mind. There is only minor variation of opinion among the several worker groups. Workers in New England seem to look with least favor on retirement at 55 or younger (9%). Workers in plants of more than 500 employees show the greatest leaning toward early retirement (22%).

As to cost, it is impossible to say how much a $100-per-month pension plan would cost at any given plant unless all of the various factors are known. Even then there is a good chance that the actuaries would disagree, but it is a cinch that few if any such pension plans can be maintained for less than 10 cents an hour. Yet almost two workers in three—63%—believe that a $100-per-month pension would cost 10 cents an hour or less. In all of the worker groups analyzed, the percentage of workers who believe such a pension would cost 10 cents an hour or less varies between 56% and 67%.

Until this mistaken impression of the cost of pensions has been corrected, management is in grave danger on the pension issue. Management has a job to do in telling workers what pensions cost.

But management also has an unparalleled opportunity to do this job in such a way that the worker will retain his present feeling that a pension is an item of cost which properly he should share with his employer.

WHAT THIS MEANS:

Despite union leaders' thumbs-down attitude toward the General Motors cost-of-living formula, the worker continues to favor such arrangements. The slight shift of sentiment away from cost-of-living wage is particularly significant in view of the wide publicity given the wage cuts that have resulted under the GM pact in the last year.

THE WORKER'S WILLINGNESS to work for less per hour if jobs become scarce is probably a further reflection of his acceptance of the cost-of-living theory. That is, if jobs are scarce, prices will be lower, so the worker's requirements will be less. But this does not necessarily mean the worker won't fight to prevent wage cuts.

The replies to the two questions, taken together, do mean one thing that is of prime importance to management:

The worker has not—at least not yet—been sold on labor leaders' "purchasing power" theory that wage boosts are the best if not the only way to avoid depression. The American worker still has enough economic horse sense to hesitate to let his union catapult the nation from depression to disaster, if depression comes. Management's big job now is to stimulate more sound economic thinking of this type.

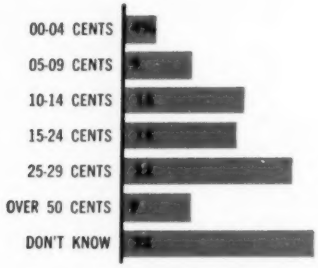
It is significant that there is little variation in the way that the several worker groups answered these two questions.

Continued on next page

4 · PROFITS ON SALES

Do you know how much profit your company makes on each dollar it charges for its products?

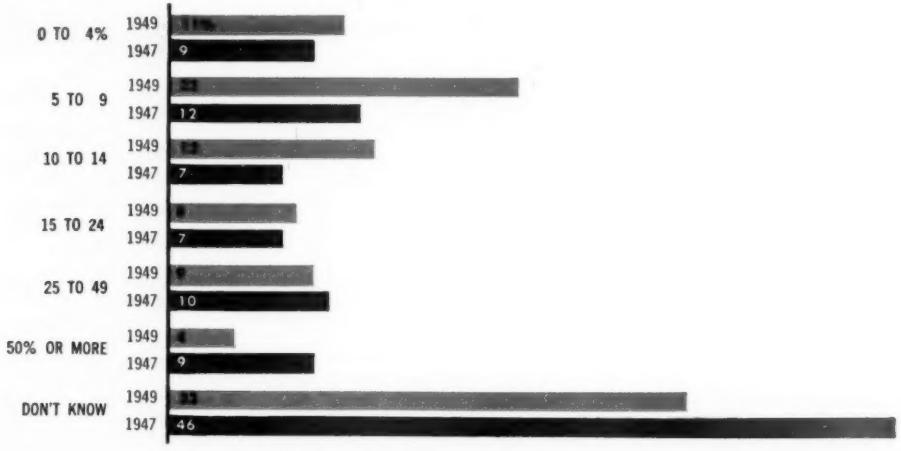
How much profit do you think it is reasonable for a company to make on each dollar it charges for its products?*



* Most answers were specific figures; they have been grouped within significant ranges for easier interpretation.

5 · PROFITS ON INVESTMENTS

About what per cent return each year do you think owners or stockholders are now receiving on the money they have invested?*



* Most replies were specific figures; they have been grouped withio significant ranges for easier interpretation.

WHAT THIS MEANS:

The worker doesn't know how much profit his company makes on its sales dollar. But he thinks 10 cents and maybe a lot more would be reasonable.

THESE TWO QUESTIONS add up to an excellent opportunity for management to bring home to workers the soundness of industry's present profit structure. In the worker's mind, industry's profits on its sales dollar are not only reasonable, but in most cases less than what the worker would consider to be reasonable. The worker's lack of information concerning the profits his company actually makes denotes an abysmal failure on the part of management to take advantage of a very promising situation.

Furthermore, there is a tremendous amount of misinformation in the heads of workers who said they *do* know how much profit their companies made last year. The 5% of workers who said they had this information were asked, "How much does your company make on each dollar it charges for its products?" Of these workers, no less than 44% said their companies make 25 cents or more on each sales dollar, and 17% said that the figure was 50 cents or more.

FACTORY also asked workers who said they knew how much their company made where they got the information. Approximately half of the answers indicated sources that could be reliable. The other half indicated sources that quite obviously were unreliable.

Examples of reliable sources:

"In the company newspaper."

"From my employer."

"From the union report on wage negotiations."

"Stockholders' report."

"The boss tells me."

"In the town newspaper."

"It is in the union paper."

"The president of the company."

Examples of unreliable sources:

"I'm just guessing."

"By how much we pay for what we buy from them at wholesale and what it sells for retail."

"Hear supervisors talking."

"I worked in production control."

"Through people I know."

"Experience in hearing conversations around the plant."

"Hearsay."

It all adds up to one simple fact: The worker is on management's side in the "profit argument," but he doesn't know it because management has failed to give him facts on which to base his judgment.

WHAT THIS MEANS:

The worker has revised sharply downward his estimate of the returns stockholders are getting on their investment.

THE FIRST POINT that stands out is this: Since 1947 a lot of workers have made up their minds on what per cent return they think investors and stockholders are getting.

To see the full effect of this decreasing amount of indecision it is necessary to adjust the figures to show a distribution of answers by those who made a definite answer. This has been done in the table shown here.

% Return	1947	1949
0 to 4%	17%	17%
5 to 9	22%	33%
10 to 14	13%	20%
15 to 24	13%	12%
25 to 49	18%	13%
50% or more	17%	6%

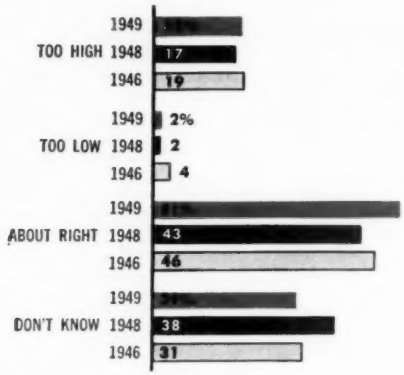
In 1947 it was possible to divide the workers' answers to these questions into two groups of almost equal size. That is, 52% of workers said stockholders were receiving 14% or less as a return on investment. 48% thought stockholders were receiving 15% or more. By 1949, however, 69% of workers thought stockholders were receiving 14% or less, and only 31% thought stockholders were receiving 30% or more.

In this area of bringing economic facts to the worker, management appears to have made real progress. But there is still a big educational job ahead for management to do.

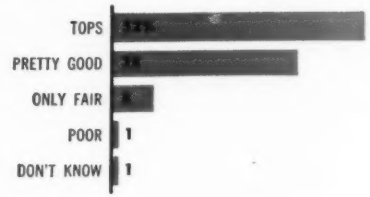
Continued on next page

6 PRICES AND QUALITY

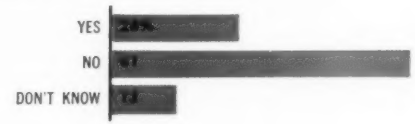
Do you think that the prices your company charges for its products are too high, too low, or about right?



What do you think of the quality of your company's products? Is it just about tops, pretty good, only fair, or poor?

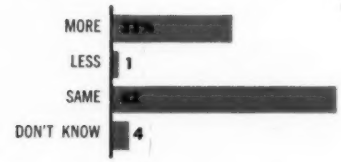


Is there unnecessary waste or spoilage of material in your plant?

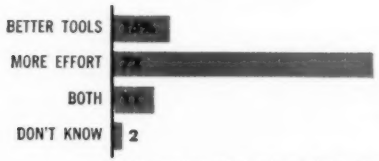


7 SPEEDUP

Do you think your company is now expecting you to do more, less, or about the same work per hour as they expected a year ago?



Is this because they have provided you with better equipment, better tools, better methods, or do they expect you to put more physical effort into the job?*

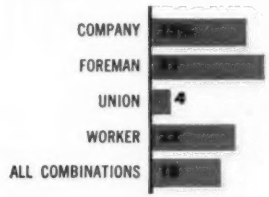


*This question asked only of those who said "more" to preceding question.

Do you consider this an attempt at speed-up by your company?*

*This question asked only of those who said "more" to preceding question.

Who should decide how much work you should turn out in an hour?



WHAT THIS MEANS:

The worker still thinks his company's prices are "about right." He likes the quality of the company's products, but he isn't too sure there may not be unnecessary waste in the plant.

OVER ALL, there has been very little change since 1946 in the way the worker feels about his company's pricing policies. Likewise, there has been no significant change in the percentage of workers in the union, nonunion, plant-size and age groups saying that prices are too high. It is particularly significant, therefore, that such marked changes have taken place in the feelings expressed by the regional groups:

Prices Too High	1946	1948	1949
New England	13%	24%	8%
Middle Atlantic States	25%	15%	19%
East North Central	15%	22%	24%
The South	16%	7%	10%
The West	22%	15%	19%

Percentages of those saying prices are too high in other key groups: CIO members, 25%; AFL members, 14%; nonunion workers, 14%; plants of under 500 employees, 15%; plants of over 500 employees, 23%.

The worker thinks most companies are doing a good job on quality and waste control. But there's a challenge here for every company to do a still better job of reducing waste and spoilage. How can that challenge be met? FACTORY asked the worker. Here are his answers:

More care by workers	24%
Closer supervision	23%
Reduced production quotas	8%
Better planning of jobs	15%
Improved machines and materials	9%
Improved worker attitude	4%
Cannot be prevented	14%

Since this question was asked only of those workers who said there was unnecessary waste and spoilage in their plant, the sample is too small for variations among the several worker groups to be significant. Some workers gave more than one answer.

WHAT THIS MEANS:

One worker in three thinks he is doing more work per hour than a year ago. He says it takes more physical effort to do it. And he calls it a speedup. But he doesn't think union participation in setting production standards is the answer.

UNION MEMBERS, not surprisingly, are more prone than nonunion workers to believe that they are doing more work this year than last (37% compared with 23%). Similarly, plant size bears a direct relationship to the workers' attitude on this question. Only 24% of workers in plants of under 250 employees feel they are being asked to do more work per hour, compared with 39% in plants of over 250.

With a single exception, variations are minor on the question of whether greater output is due to more effort or better tools. That exception is the South. Of workers in the South, 26% say that the increase in production is the result of better tools. No more than 14% of workers in any other section are of this same opinion. Membership or nonmembership in the union has no discernible influence.

The answers to the third part of this question make it clear that the union's cry of speedup has had its effect. But management would be mistaken to believe that, because workers recognize better tools as the source of greater output per hour, they do not charge management with "speedup." A cross-tabulation of answers showed that even among workers who recognized better tools as the cause of increased production, 75% charged their companies with "speedup." However, the number of workers saying "better tools" was small. The result, therefore, is to be interpreted as a general indication and not as a reliable statistic.

One thing is certain: The worker does not look upon union participation in setting production standards as the answer to his "speedup" problem. Only 4% of workers say that the union should set production standards. Even among union members themselves only 5% say so. A tabulation of the "combination" answers discloses that only an additional 7% of workers believe the union should be one of two or more participants in setting standards.

The point management should not overlook is the worker's desire to have his foreman participate in setting standards.

In November, Part 2—What the Worker Really Thinks About the Labor Law, Health Insurance, Discrimination, Layoffs, and His Own Company

SLOGAN VOTING CONTEST is summarized on poster at left. Employee participation in slogan contest was 75 per cent. Assembly department's display for publicizing waste appears at right

How You Can Win Your

Want a blueprint for your next waste reduction campaign? Here's one that got quick results for one company—and might be as much of a help for yours

CHARLES R. SCHUBERT • FIELD EDITOR, FACTORY

EVEN THOROUGH WASTE CONTROL fell short of the mark at The Standard Register Company, Dayton, Ohio. An all-out waste *reduction* campaign, aimed at carelessness rather than inefficiency, was found to be the only solution. It got everybody in the plant worrying about the problem.

Standard had found that much of its waste came from strict adherence to a fixed top-quality policy. The demand for complete customer satisfaction placed a higher price tag on errors. This, plus higher labor and materials costs, meant waste was costing more, even though the amount of waste was not much greater.

Earlier efforts to *control* waste had been built around three major attacks:

1. A company-wide work simplification program (FACTORY—March, 1949) developed better methods to eliminate wasted time, effort, and materials.

2. A paper waste committee improved scheduling, studied paper specifications, and provided exact roll sizes to reduce trim loss.

3. A well-organized suggestion program provided numerous cost reduction suggestions.

It wasn't enough. The waste level remained too high. So, the new waste reduction program had to go further. It had to make every person in the company waste-conscious.

The New Program

The first step was to appoint a ten-man policy committee. This committee was to study the problem, make plans for solving it, and

HOW MUCH IS TIME WORTH
IF each employee wastes 20 min. per day at an average cost of 2½¢ per minute.
144 Employees X 20 min. = 2880 min.
2880 min. wasted X 2½¢ per min. = $72.00 per day
$72.00 per day X 250 working days =
Wastys Pay $18,000 per year
Cut Wasty off the payroll to make our own jobs MORE SECURE
Think - Suggest Ways to Save Time !

DEPARTMENTAL POSTERS get employee attention. Layout department's poster (left) symbolizes way in which waste adds up. Right, photo-offset department emphasizes cost of wasted time

War on Waste

put the plans into action. The committee included representatives from all major divisions.

Out of its first few sessions came the conviction that a program could not succeed without whole-hearted cooperation of supervisors. The committee prepared a selling outline to get them interested:

1. Waste benefits no one.
2. Waste endangers jobs.
3. Waste hinders progress of the company and its employees.
4. Waste affects service to customers and weakens competitive position.
5. Waste is higher than ever before because of higher labor and materials costs, increased volume of business, and increasing carelessness.

Objectives of the waste reduction program were listed: It must stimulate interest in the suggestion program. It must make all employees cost-conscious and aware of the need for accuracy and care. It must recognize and reward efforts of employees to reduce waste.

The committee went still further in emphasizing the importance and value of the program. It thought up ideas for a campaign:

1. An advance "build-up" phase to start the program in high gear.
2. A concentrated drive lasting

DISPLAY made by receiving and stores department shows employees the actual waste from two rolls of paper and one of carbon

from 30 to 90 days to make employees permanently waste conscious.

3. A sustained program extending the full year, sparked by occasional short drives.

4. Expansion of the suggestion system's awards.

5. Emphasis on departmental waste problems, with examples of over-all waste conditions.

6. Supervisory responsibility for selling the campaign to employees, with backing of top executives.

7. Identification of waste as the company's biggest problem, and as a threat to job security and successful operation.

8. A cartoon character ("Wasty") to symbolize the problem.

The committee was then ready to move. All facts and proposed plans were incorporated into a chart presentation made in meetings of the supervisory groups. These plans, it was stressed, were only tentative. They were subject to immediate change, if better ones were offered.

After this build-up, supervisors were handed a questionnaire and asked to give their opinions of the preliminary plans. They responded with a 100 per cent return.

The campaign was based on their replies. They chose to hold a slogan contest to awaken employee interest, and selected ten slogans to be used in the contest. They set the duration of the initial drive at 60 days. They gave the questionnaire so much constructive thought that many new ideas were uncovered. The plan now contained the supervisors' recommendations, and they gave it whole-hearted support.

Launching the Program

By the last week in December, 1948, the WOW campaign (Wipe Out Waste) was ready. To secure a smooth start, all supervisors were sent a timetable outline to be followed during its first few weeks.

The opening drive started with the new year. Employees returned to work to find the plant and offices plastered with banners and posters. Their supervisors handed them a folder and ballot describing the slogan contest. Every employee could participate. Employees were to rank the ten slogans in order of appeal. The slogan ranking first on the greatest number of ballots would become the official slogan of the campaign. The three employees who ranked the most slogans in the order showed by the total vote would receive U. S. Saving Bonds as prizes.

The contest accomplished several things. Each employee filled out a duplicate ballot so he could check his list against the final results. This kept the ten slogans in front of him for at least a week—the duration of the contest. Also, in ranking slogans from one to ten, he re-read the complete list many times and became familiar with its contents. In helping to choose the official campaign slogan, he was given a feeling of participation. This was increased by having each employee write an original slogan on his ballot.

Widespread Interest

Participation was about 75 per cent. Final results and photostats of winning ballots were posted on big displays throughout the plant.

Along with announcement of the slogan contest, a letter was sent to employees' homes. It advertised the waste reduction drive and offered special prizes for suggestions.

Many ideas for increasing waste consciousness came from supervisors. One was the use of "funny money," made up to resemble paper money and printed in several denominations. Bills bearing waste slogans were distributed to emphasize the fact that waste of specific materials actually costs money.

Each department waged its own internal campaign through preparation of charts, posters, and displays.

Supervisors developed a wide variety of extremely effective displays. In the original questionnaire, they ranked waste of time and materials as being by far the most significant. But waste of supplies, equipment, and tools were also considered important. Many posters emphasized waste of these items. Others pointed out the relation of waste to job security, quality, housekeeping, carelessness.

Keyed to the everyday work of employees, posters got real results. With their departmental problems graphically portrayed before them, employees began to visualize ideas for waste reduction. In a few days, suggestion volume was more than double normal.

Top management watched the program closely. Throughout the campaign, the president and executive vice-president met with small groups of employees. In these meetings they tried to show how employees would be affected by the outcome of the waste reduction program. At the same time, means for attaining the company's objectives were outlined:

1. To cut waste drastically—of materials, time, and machines.

2. To improve methods—by seeking the better way.

3. To shorten the production cycle—from order to shipment.

4. To improve services—thus improving customer relations.

5. To develop team spirit—and to work toward a common goal.

Immediately following these meetings, a questionnaire was distributed to supervisors. It requested an evaluation of employee reaction and a report of progress on other aspects of the program.

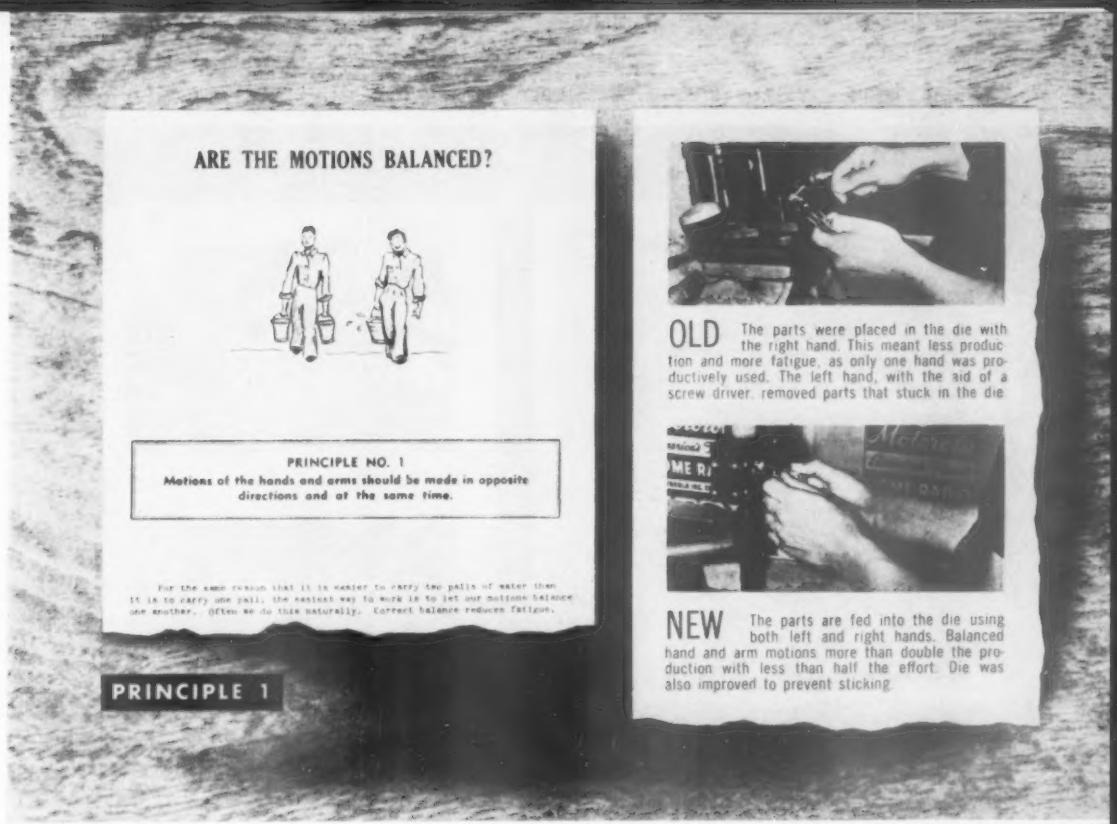
Promoting Suggestions

At the close of the campaign's second week, a concentrated drive was initiated to put to work the waste-consciousness already developed. A second letter to employees' homes touched off the drive. It was followed by a feature story on the campaign in the company's employee publication. The importance of supervisors to the program again was apparent. They talked to employees on the job, urged them to submit suggestions, and sent weekly departmental newsletters to their homes. These newsletters compared their department's suggestion record with those of other departments, and used various appeals to promote employee participation. Efforts met with great success. Records at the close of the two-month initial campaign phase showed 609 ideas submitted, compared with 1589 for all of 1948.

The waste reduction campaign is geared to run throughout 1949. It is not expected that suggestions will be submitted at the same rate for the rest of the year. Morover, company officials know that suggestions will not reduce the employee carelessness that causes a large part of the waste.

As a result, the chief aim is to keep employees thinking about waste. This will be accomplished by short, concentrated drives on related subjects.

The committee realizes that complete elimination of waste is impossible. It knows, too, that waste *can* be reduced. By teaching employees that fact, the committee is solving one of the biggest problems in industry today.


ARE THE MOTIONS BALANCED?
PRINCIPLE NO. 1
Motions of the hands and arms should be made in opposite directions and at the same time.
PRINCIPLE 1
OLD The parts were placed in the die with the right hand. This meant less production and more fatigue, as only one hand was productively used. The left hand, with the aid of a screw driver, removed parts that stuck in the die
NEW The parts are fed into the die using both left and right hands. Balanced hand and arm motions more than double the production with less than half the effort. Die was also improved to prevent sticking

Using Pictures to Sell Foremen on Methods Improvement

Motorola wanted its supervisors to remember nine fundamentals of methods improvement. A combination of pictures and chuckles turned the trick

WHAT'S THE BEST WAY to get supervisors interested in improving methods? Motorola Division of Stewart-Warner Corporation came up with an answer in the form of a booklet bearing the stimulating title, "Finding Better and Easier Ways to Work . . . the Motorola Way."

Its editors told in clear, concise form how to use the basic tools of methods improvement, the flow diagram and process chart. They told what questions to ask of present operations. And they set forth the nine principles to be applied in finding a better way in such a manner that few supervisors will ever forget them.

The technique was an old one, and also a simple one. It was based on two facts that are all too frequently overlooked in preparing manuals:

1. Most men will remember a joke far longer than they remember a lecture.

2. Most men will remember something they see far longer than something they read—even though they see it only on the printed page as a cartoon, a drawing, or a photograph.

The illustrated case studies on this and the following pages show how Motorola did the job. Reproductions are from the original art work. Text has not been edited

Can we eliminate the boarding house reach?

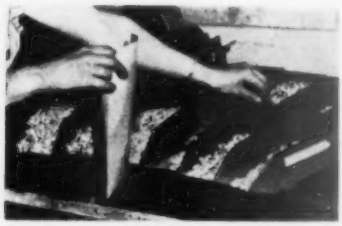
PRINCIPLE NO. 2

Tools and materials should be located close in, and directly in front of, the operator so as to be within easy reach of the hands.

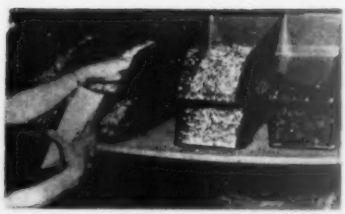
Let's look at the work place over the operator's shoulder . . . see the same as we sees it. It becomes apparent at once that there is a very definite and limited area which the operator can use with a normal expenditure of effort.

At bench, table, desk, or machine the normal working area may be easily determined by holding a piece of chalk in the hand and drawing an arc with a [illegible] or bench with the [illegible]

PRINCIPLE 2



OLD The "boarding house reach" for parts



NEW Parts are placed within the normal work area so that the "boarding house reach" is eliminated

Does gravity bring the materials to the point of use and are drop deliveries in effect?

PRINCIPLE NO. 4

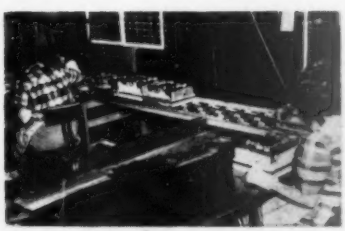
Gravity feed bins for material and drop delivery for finished pieces should be used.

Do the operators in your department have to bend over to pick up pieces from the floor or tote box on the floor? Considerable energy and time is often lost and the machine is idle while the operator hunts for parts. Perhaps the use of a bin with a sloping bottom which permits the material to be fed to the front by quantity will save [illegible] and vitally important [illegible].

Many of our materials are of a type which may be dropped or slid down a chute without damage. However, if this treatment does result in damage to the finish or cause breakage a felt or canvas may solve the problem.

PRINCIPLE 4

NEW The quickest way to get rid of a completed part is to drop it.



NEW Putting gravity to work carrying parts between operations.

Is there a definite fixed place for all tools and materials?

PRINCIPLE NO. 3
There should be a definite and fixed place for all tools and materials.

The operator should always be able to find the tools and materials in the same location. Likewise, finished parts and assemblies should be disposed of in fixed places. Definite stations for materials and tools aid the operator in habit formation, and permit him to quickly reach standard performance. It cannot be emphasized too strongly that it is greatly to the operator's advantage to be able to perform the job with the least mental direction. Pre-

PRINCIPLE 3

OLD Notice parts are not in a fixed location requiring operator to search for them.

NEW Parts are within easy reach. Definite stations for materials and tools.

Do foot controls relieve the hands for more useful work?

PRINCIPLE NO. 5
The hands should be relieved of all work that can be done better with the feet.

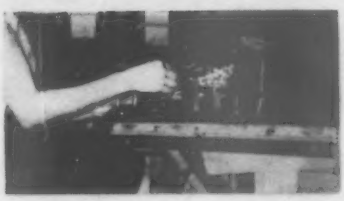
There are many possibilities for increasing production on existing equipment by adding a foot pedal which will "free" the hands for useful work. Many machines are equipped with foot pedals as a matter of course. Punch presses, hammers, and trim presses are some examples. Other machines not originally equipped with foot pedals have shown startling production gains when this simple improvement was made.

Ask these questions about the job:

1. Would a foot-operated feed be less tiring?

2. Would it allow the operator to have the next part ready without delay?

PRINCIPLE 5



NEW Using a foot control allows the hands to do productive work. This principle can be used on many assembly operations to good advantage. It helps to make the job easier.

Are devices used to free the hands of holding?

The hand is the poorest and most unsafe holding device.

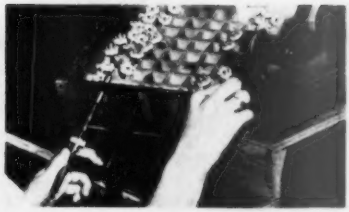
PRINCIPLE NO. 6

Simple fixtures, jigs, or other holding devices should be used wherever possible.

The value of our hands is so great we cannot measure it in terms of money and yet we see them used as holding devices in many operations -- 60%, 70%, and even as high as 90% of the total cycle time. As holding devices, our hands are unsteady, inaccurate, and unsafe -- as anyone who has ever crushed a thumb with a hammer will agree. Yet one of the commonest errors that we make on bench work, light assembly jobs, and short production runs is to imitate a

PRINCIPLE 6

OLD The left hand holds the part. The crudest clamp is better than the hand on any job.



NEW An inexpensive jig holding parts during an assembly operation allows the hand to do productive work.

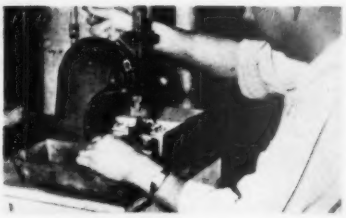
Are we passing up a two-at-a-time possibility?

PRINCIPLE NO. 8

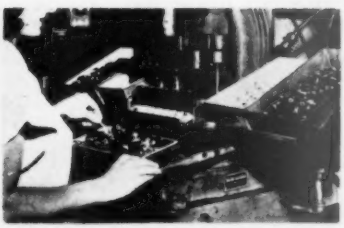
Parts should be made in multiples wherever possible.

We can often double our output by making two or more parts at a time. Gang milling, gang grinding, gang drilling, and gang forging are familiar to all of us. This same principle can be applied to other machines with similar production gains. The question should be asked about every job: Can two or more parts be processed at the same time? In some cases, with very little additional expenditure of [illegible] or fixture could be built [illegible]

PRINCIPLE 8



OLD Pressing shaft into pushbutton one at a time.



NEW Using multiple die to do six at a time. More production, less effort.

Are the tools and materials pre-positioned?

PRINCIPLE NO. 7

Tools and materials should be pre-positioned wherever possible.

A fountain pen in a desk holder is pre-positioned, that is, the pen is ready to be used without changing its position. In a shop tools should be placed as nearly as possible in the position which they will be used. Likewise, material coming from one machine or operator in proper order should be passed on to the next machine or operator in proper position for use. Too often the parts are dumped in a tote box and have to be sorted and positioned before the next operation can be performed. In the case of tools many times they are laid on the bench or floor after each time they are used. An easier and more convenient way is to pre-position the tool [illegible]

PRINCIPLE 7

OLD Two operations were required to use air wrench. Operator had to pick up tool before and after each use. Lots of lost time was required to perform these unnecessary operations.

NEW Tool is pre-positioned over the work. Tool is always in the same place, making it unnecessary for the operator to pick it up each time it is used.

Is the job set up with ejector and quick-acting clamps?

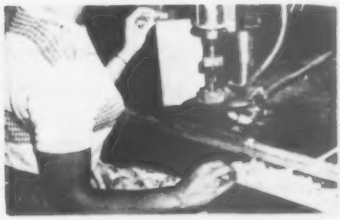
PRINCIPLE NO. 9

Ejectors and quick-acting clamps reduce handling time.

Any operation may be divided roughly into three parts: (1) get ready; (2) do; (3) dispose. Only the second element -- Do -- represents productive time. Time saved on the other two elements means more time for productive work. Quick acting clamps will reduce the time required to "get ready" and to "dispose." Time spent in screwing tight a part in a drill jig can be saved by a simple cam or toggle-actuated clamp. An air chuck or vise will often increase production substantially -- simply by reducing the time and effort of "get ready."

Additional increase in production is often made possible by the use of ejectors. Sometimes a knockout pin can be used to remove a part from a jig. In other cases, a small air cylinder with a plunger can be used to eject the part as soon as the operation has been completed.

PRINCIPLE 9



OLD This hand-operated press requires manual removal of finished parts.

NEW Automatic kick-out eliminates handling of finished parts.

PILE OF BLUEPRINTS (left) is big enough to fill a standard file drawer. Stack of envelopes (right) contains 70-mm. negatives of same blueprints, requires one-thirteenth as much storage space

We've Microfilmed 2,000,000

Westinghouse salvaged valuable floor space. So can you—by using 70-mm. film to make permanent records of your engineering drawings

J. J. DELLER • FACTORY SERVICE DIVISION, WESTINGHOUSE ELECTRIC CORPORATION, EAST PITTSBURGH, PA.

MORE THAN 2,000,000 engineering drawings have been transferred to 70-mm. microfilm at Westinghouse. This is part of a microfilming program aimed (1) to save space, and (2) to provide permanent, reproducible records. We also use 35-mm. film for smaller items.

The program has made it possible to clear space for productive use. We have also been able to set up a more efficient record system by reducing the size of tons of permanent records. Microfilm reproductions of all new and changed engineering drawings are now being made daily in lieu of fire-file copies. When recorded on film, documents and drawings that formerly occupied thouands of square feet of floor space can be stored in a vault 20 feet square.

Shop orders, specifications, and, in general, all records of 8½x11-in. size or smaller, are photographed on 100-ft. rolls of 35-mm. film. All engineering drawings, however, are photographed on 70-mm. film because a print up to 24x36 in. can be made in one shot from a negative of that size.

Records of 8½x11-in. size or smaller are fed into an automatic camera machine which snaps the pictures at an average rate of 35 per minute. Larger ledger sheets, engineering drawings, and tracings are photographed with a camera suspended above the table at the proper height for focusing. To make the picture, we only adjust the movable camera head to the proper, predetermined height for focusing, as tabulated on the apparatus, for various sizes of drawings; place the drawing on a table in accordance with position markers; regulate the light intensity with a rheostat, so that the light meter on the small tripod indicates the correct value; and trip the shutter with a foot pedal. Approximately 2500 drawings per day can be photographed in this way.

Prior to the establishment of the

DRAWING is photographed (left) on 70-mm. film . . . and negative is filed (top right). Telephone call for information can be handled (bottom right) by placing negative in viewer, where it is easily readable

Engineering Drawings

microfilming program, many steel file cabinets were purchased annually to house engineering drawings, shop orders, specifications, etc.

Great Space Saving

One 4-drawer cabinet was required to store 1400 8½x11-in. folders containing these items. When recorded on 35-mm. film, the same records fill just one 100-ft. film roll. Similarly, 4800 film envelopes of 3x5-in. size, each containing one 70-mm. negative, occupy approximately the same space that is normally taken up by 375 blueprints.

When a print is required from one of the 70-mm. negatives, it is necessary only to check the index card for the drawing number and remove the corresponding envelope from the file. The 35-mm. microfilm was not as satisfactory, since with this size it was necessary not only to get the film roll number from the index card file, but also to run the film through a viewer until the particular item was located.

One of the big savings resulting from the use of microfilm has been realized in the reproduction of old and lost drawings. The cost of hand-tracing a drawing on transparent paper is about $6 a square foot; on cloth, approximately $4.75 a square foot. A projected print can be made from 70-mm. film on transparent paper at a cost of 75 cents a square foot, or on cloth at a maximum of $2 a square foot (depending on the condition of the original subject).

Many times daily information from a drawing is required, such as the date and nature of the latest change, but a print is not needed. In the past, this information has been typed on an index card known as the master record and has been made available over the telephone to those who want it. Consideration is now being given to abandoning this file and using the 70-mm. film as a source of such information. In the event that an engineer, draftsman, or clerk calls and requests information about a particular drawing, the film can immediately be pulled from the file and placed in a viewer which magnifies the image several times. From this image the clerk not only can give facts pertaining to changes, but can also give any other information that is needed from the drawing, quickly and accurately.

A Medium With Many Uses

Microfilm is not the answer to all the problems encountered in engineering reproduction. But our experience with it, and particularly with the 70-mm. microfilm in the short time it has been available, indicates that certain features connected with its application make it the most advantageous medium in a variety of cases.

6 **Maintenance Department Monthly Progress Report**

MONTH OF JULY, 1948

MAINTENANCE (APPROPRIATION JOBS)	JOBS	HOURS
ON HAND, PREVIOUS MONTH'S REPORT	37	10897.1
ADDED DURING MONTH	5	254.0
TOTAL LOAD FOR MONTH	42	11151.1
JOBS COMPLETED AND HOURS WORKED ON JOBS	21	1226.0
TOTAL LOAD, AS OF END OF MONTH	21	9925.1

NEW WORK (APPROPRIATION JOBS)	JOBS	HOURS
ON HAND, PREVIOUS MONTH'S REPORT	48	2328.7
ADDED DURING MONTH	11	1173.0
TOTAL LOAD FOR MONTH	59	3501.7
JOBS COMPLETED AND HOURS WORKED ON JOBS	19	1246.0
TOTAL LOAD, AS OF END OF MONTH	40	2255.7

SUMMARY	HOURS	PER CENT
HOURS WORKED ON MAINTENANCE (JOBS UNDER $50)	4872.0	41.1
HOURS WORKED ON NEW WORK (JOBS UNDER $50)	2268.0	19.1
HOURS WORKED ON OILING, INSPECTION, AND ROUTINE JOBS	2265.5	19.3
HOURS WORKED ON APPROPRIATION JOBS	2472.0	20.5
TOTAL HOURS WORKED DURING MONTH	11877.5	100.0

NUMBER OF WORKERS ON PAYROLL — 103

PROGRESS REPORT is issued monthly. It shows maintenance executive what has been accomplished in the past month and what the future work load is for all pending maintenance jobs, both large and small

Now We Get Cost Data We Need for Real Maintenance Control

GEORGE STEINBRONN · MANAGER, ENGINEERING DEPARTMENT
JOHN B. STETSON COMPANY, PHILADELPHIA

Part II. *In September, how Stetson accumulates cost on maintenance projects, plus upkeep cost on each of 6000 machines. Now, how Stetson translates cost data into reports that highlight inefficiencies in maintenance and point the way to investigation and correction.*

EFFECTIVE MAINTENANCE CONTROL depends on two major factors: (1) accurate accumulation of maintenance costs, and (2) regular review and interpretation of these costs to guide executive action.

With the help of a mechanical tabulating system Stetson gets periodic detailed costs of its maintenance operations. It then becomes necessary to translate these costs into condensed executive reports that will highlight inefficiencies and thereby lead to correction of such situations.

To this end, the maintenance clerk prepares three control reports, and the cost accounting department a fourth one, which are described below. These four reports, plus a semi-annual review of machine costs to be discussed later, are all the reins needed to drive down the operating road at top efficiency.

Maintenance Department Monthly Progress Report (Figure 6)

This is the road-map of over-all maintenance operations, showing the nature of labor-hours expended. It traces in detail the progress of the work load on major projects

7 Monthly Maintenance Charges

MONTH	BLDGS. & YARDS 601			STEAM 602			AIR 603			DRINKING WATER 604		
	LABOR	MAT.	TOTAL	LABOR	MAT.	TOTAL	LABOR	MAT.	TOTAL	LABOR	MAT.	TOTAL
MAY	1159	594	1753	697	51	748	-	-	-	105	10	115
JUNE	906	406	1312	420	16	436	-	-	-	105	14	119
JULY	671	118	789	149	22	171	-	-	-	104	47	151
AUG.	609	143	752	160	5	165	15	4	19	110	8	118

MAINTENANCE CHARGES for work on plant service facilities are reported monthly on this sheet. Analysis reveals any trends and deviations that might require investigation in order to keep cost in line

ACTUAL EXPENDITURES for labor-hour charges and material costs are totaled on an accumulative report. It provides executives with sufficient data for controlling cost of big projects

8 Account of Actual Expenditures

APPROPRIATION NO. 6653 OVERHAUL NO.2 GENEST "A" MACHINE (#140)

LOCATION 23-1 ESTIMATE COMPLETED 9-3-48

WEEK ENDING 1947	MACHINE, HRS. CURR.	MACHINE, HRS. CUM.	PIPE, HRS. CURR.	PIPE, HRS. CUM.	TIN, HRS. CURR.	TIN, HRS. CUM.	CARPENTER, HRS. CURR.	CARPENTER, HRS. CUM.	PAINT, HRS. CURR.	PAINT, HRS. CUM.
7-19	35	-	37	-	4	-	12	-	-	-
7-26	126	161	-	37	-	4	-	12	-	-
8-2	137	298	-	37	20	24	-	12	-	-
8-9	80	378	-	37	6	30	-	12	-	-
8-16	69	447	-	37	-	30	-	12	7	-
8-23	15	462	30	67	14	44	-	12	24	31

WEEK ENDING 1947	ELECTRICAL, HRS. CURR.	ELECTRICAL, HRS. CUM.	MASON, HRS. CURR.	MASON, HRS. CUM.	TOT. CRAFT, HRS. CURR.	TOT. CRAFT, HRS. CUM.	MATERIALS, $ CURRENT	MATERIALS, $ CUMULATIVE
7-19	2	-			90	-	-	-
7-26	2	4			128	218	308.62	-
8-2	-	4			157	375	-	-
8-9	-	4			86	461	-	-
8-16	5	9			81	542	-	-
8-23	4	13			87	629	503.92	812.54

9 **Completed Job Report**

JOB NO. 6653 DATE STARTED 7-15-48 DEPARTMENT 802

MACHINE ESTIMATED COMPLETION DATE 9-3-48 DATE COMPLETED 8-23-48

DESCRIPTION OVERHAUL NO. 2 GENEST "A" MACHINE (#140)

CRAFT	LABOR, $		MATERIAL, $		TOTAL, $	
	ESTIMATE	ACTUAL	ESTIMATE	ACTUAL	ESTIMATE	ACTUAL
MACHINE						
PIPE						
TIN						
CARPENTER						
MASON						
PAINT						
ELECTRIC						
TOTAL	989.00	993.82	844.00	812.54	1833.00	1806.36

REMARKS

JOB REPORT is drawn up by accounting department for every job over $50. It is routed to maintenance and production department heads, and to management for interpretation and comparison with cost estimates

(appropriation jobs over $50) and summarizes the labor-hours for small jobs. It affords comparison with what's behind and what's ahead, giving good labor control.

Labor-hours as a unit of measure affords a better control gage than labor-dollars. Likewise, material-dollars could be included if deemed helpful, but nothing would be gained other than a more complicated report.

The progress report is developed mainly from the two monthly machine tabulations on total labor-hours for appropriation jobs and on standing work orders. These tabulations are easily analyzed by marking them item by item for repair work (R), new work (N), and maintenance service work (S).

For example, any standing work order in the general group for "new work and alterations" is obviously marked "N"; any order in the "routine inspection" group is "S." Likewise, the nature of each appropriation job is known, or can be easily checked. The "hours" figure for appropriation jobs "added during month" is obtained from the original appropriation estimates.

Monthly Maintenance Charges (Figure 7)

Control over the maintenance costs of those general plant facilities which are the sole responsibility of the maintenance department is gained by this continuing monthly report. It provides a pattern for spotting deviations from the normal, and for regularly appraising the validity of each normal for possible reductions. There simply is no substitute for knowing exactly what these major facilities are costing each month.

These statistics are picked right off the monthly tabulations, by standing work-order number, of labor-hours and material costs. A loaded factor is derived by dividing the total maintenance payroll (including direct and indirect labor) by the total hours of direct maintenance labor. It's a simple calculation that absorbs all indirect costs with bookkeeping accuracy, and charges them proportionately.

Account of Actual Expenditures (Figure 8)

Big jobs can lag or can run far beyond estimates unless controlled by a weekly accumulative report such as this one. It is set up at the beginning of every appropriation job and continutes until its completion. By it the maintenance supervisor knows where he is going before he gets where he doesn't want to be.

Control is effected by checking the weekly labor-hour accumulations of each craft against the original estimate. For this purpose the account sheet is filed in the same loose-leaf binder as the estimate, on a facing page.

Labor-hour figures can be obtained weekly, but material cost entries are possible only each fiscal month. This is no handicap to control, however, which is dependent chiefly on a knowledge of labor-hour performance.

Completed Job Report (Figure 9)

Upon completion of each appropriation job, the cost accounting department prepares a report showing its total final cost in dollars. It is compiled from the regular monthly tabulating report.

Copies are circulated by the

maintenance department to all interested management men. This includes the originator of the work order, so that in making budget decisions he can better weigh the value of possible future projects of the same kind.

Semi-Annual Tabulation

There remains an explanation of the use of the semi-annual tabulation of labor-hour and material costs for each machine that bears an inventory number.

This report comprises a listing of every machine, by number, that has involved any maintenance expense since the origin of the new system two years ago. Condensation is not feasible because its very value lies in its detail. It shows cumulative labor-hours and material dollar costs for jobs under and over $50, hence all work of any nature. It serves as a supplementary equipment record.

At first this report was issued every fiscal month, but it was found that for the purposes a 6-month report was good enough. The report costs little extra to tabulate and is really a valuable byproduct of the regular maintenance tabulating setup.

Here are some of the uses for this report:

1. It is used by the maintenance executive for preparation of comparative maintenance costs on machines to justify new purchases.

2. He scans it for large items to find out why those costs are high. If facts on causes, types of repairs, etc., are wanted, they can be found by examination of "description of work" on the machine cards.

3. He watches trends on rising costs by charting curves of overall costs at 6-month intervals.

4. Likewise he can study and follow individual or group trends. Eventually he will have an idea of what the maintenance cost of a machine should be. It's but a further step to establish maintenance budgets. Prior reference was made to the nonuse, for the present, of the "machine maintenance budget" section on the labor-hour tabulating card. This is because of the absence of reliable figures. It is hoped these can be obtained when enough historical data have been accumulated by this "machine" report. When that happens, the budget figures will be included in this tabulation, and will thereby highlight out-of-line costs.

Beforehand, management had accurate checks only on the quality of work and productivity of a machine. Now it also checks *maintenance* costs. How well this latest check serves is illustrated by two similar machines of different manufacture which showed no superiority over each other production-wise, but one showed maintenance costs four times higher than the other.

Experience with the new system to date has proved its value. It gives accurate statistics in a multiplied degree of refinement at half the old clerical cost. It has provided the controls sought for in the objectives. Management bases its decisions about suggested improvements or replacements on facts, not opinions. The historical information the system hoards is proving increasingly useful for all phases of control and future budgeting.

That's a big order for any system to fill satisfactorily, but this one is doing it well.

New "Overtime-on-Overtime" Guide

YOU CAN NOW GET an up-to-date statement that will guide you on how the new "overtime-on-overtime" law is going to be interpreted and applied. Just ask for a copy of Release ZD-224 at any of the Wage and Hour offices.

The new release brings wage-hour policies back to where they were before the Supreme Court's upset decision on overtime pay in the Bay Ridge stevedoring case a year ago. In that decision, the court held that extra pay for working nights and at other unusual hours was not "overtime." Real overtime, the court said, is extra pay for working longer than a specified period of time or number of days.

Thus workers getting time-and-a-half for work on a holiday or a night shift, or for work after a certain hour of the day, were entitled to overtime-on-overtime if they worked beyond 40 hours in the week. The time-and-a-half did not count as overtime at all. The extra half-pay had to be averaged out and added to the base rate to determine the regular rate on which "real" overtime would be due.

This is now corrected in the amendments to the Wage-Hour law contained in H. R. 858 (Public Law 171, 81st Congress), signed by President Truman on July 20. The new law provides that time-and-a-half pay for work on Saturdays, Sundays, or holidays, or for the sixth and seventh day of the work week, or for work beyond a regular work day or week, is true overtime. As such, it may be credited toward any overtime pay due under the Wage-Hour law. Also, the extra pay need not be included in computing the "regular rate" on which overtime must be based.

In its interpretation of these provisions, the Wage-Hour office points out that they apply to "rotating shift" arrangements where an employee has a bona fide basic or regular work week, although his days of rest may fall on different days of the week, depending on the shift he works. But, cautions W. R. McComb, Wage-Hour administrator, the new amendment is limited in all cases to premiums based on rates and work periods "established in good faith." As usual, officials will be on the watch for what they call "artificial schemes" for classifying some hours as straight-time working hours and others as overtime hours. For business men, this means one thing: If in doubt, check your plan with wage-hour people; you can't always tell just what they will consider "artificial."

The new law applies retroactively to all industries. This removes a big worry for many employers, since the retroactive application wipes out any pending or potential claims by unions or employee groups. The original bill passed by the House applied only to stevedoring and construction industries. Correction of this limitation and adoption of the retroactive provisions were pushed by the Senate.

WHERE RAISES WILL COME UNDER 75¢ MINIMUM

These Bureau of Labor Statistics estimates were presented to Congress recently by Labor Secretary Tobin. The manufacturing-industry breakdown is based on July, 1947, figures, the latest available. Pay boosts since then have probably cut the percentages of employees earning less than 75¢ an hour — but not much

INDUSTRY	% UNDER 75¢
Electrical machinery	Less than ½%
Iron and steel and products	Less than ½%
Transportation equipment	Less than ½%
Machinery (except electrical)	1.0%
Rubber products	1.0
Nonferrous metals and products	2.0
Paper and allied products	6.0
Chemicals and allied products	7.0
Textile mill products	10.0
Printing, publishing, allied industries	12.0
Food and kindred products	17.0
Apparel and other finished textile products	21.0
Furniture and finished lumber products	21.0
Leather and leather products	23.0
Tobacco products	35.0
Lumber and timber basic products	47.0

NEW WAGE RULES

How They Will Affect Your Business

FEDERAL WAGE REGULATIONS are on the "must" list for plant operating executives these days. Here's why:

1. The minimum wage will go from 40¢ to 75¢ an hour around the end of this year. There will be some change in coverage, but none of great practical importance.

2. Secretary of Labor Tobin is working on even higher minimums for companies with government contracts exceeding $10,000.

3. Wage-Hour Administrator McComb is changing the rules covering exemption of "management employees" from overtime pay regulations.

MINIMUM WAGE

The 75¢ minimum wage rule will give an estimated 1.3 to 1.5 million industrial workers a raise. That's about 6% of the 22.6 million now covered by the Fair Labor Standards (Wage-Hour) law.

Labor Department estimates of the number of workers affected in different industry groups show a big spread. Some will be hard hit (lumber and tobacco, for example). Others will hardly notice the change (see chart above).

Where minimums are below 75¢, executives have a real problem. That's because it's easy to size up direct costs of raising sub-minimum workers, but not so easy to measure indirect costs.

Wage differentials will be narrowed. And the higher paid workers will surely be asking raises to restore the differentials to previous levels. Union pressure also will be strong for this. In fact, where rates have been low, it is possible that another round of increases could be sparked by the new law.

GOVERNMENT CONTRACT WORK

Under the Walsh-Healey Public Contracts Act, the Secretary of Labor has power to determine "prevailing minimum wages" for work done on government contracts of more than $10,000. So far, 43 industrial minimums have been set.

Since early last year, Secretary Tobin has already raised the minimums for several industries:

Flint glass, from 42½¢ to 83½¢;

Iron and steel, from 45¢, 58½¢, 60¢, and 62½¢ to $1.08½, $1.19, $1.23;

Men's hats and caps, from 67½¢ to 85¢;

Textiles, from 40¢ to 87¢;

Uniforms and clothing, from 60¢ to 85¢.

One entirely new rate also has been set: woolens and worsteds, $1.05.

Tobin is going ahead with his program to build up Walsh-Healey minimums. He is about to issue new figures for the soap and aircraft industries. And investigations are under way in other industries, including chemicals.

New government contract minimums have all been higher than the 75¢ Wage-Hour figure. Contractors with sub-minimum rates will therefore have even more trouble in making adjustments. Take flint glass, for example. The new rate of 83½¢ is almost double the old one. Even if you had been paying no less than 75¢ in a glass plant, you would still have to add another 8½¢ for employees working on government contracts you might take. If you did this, then you would have a tough job explaining to the rest of your worksrs why they shouldn't get an 8½¢ raise.

Of course, many of the old Walsh-Healey minimums won't apply after the new Wage-Hour rate becomes effective. The least you can pay then will be 75¢.

WAGE-HOUR COVERAGE

Congressional arguments over what groups of workers should be covered by the Wage-Hour law are of real concern to some industries. But to most manufacturers, the arguments are academic.

If you are in interstate commerce (if not sure, check Wage-Hour offices) and you are a manufacturer, most of your workers are certainly covered. Even if your janitors, or maintenance workers or some clerks *weren't* covered, you probably wouldn't want to treat them any differently.

For one thing, the paperwork would be a problem. You would have to have two sets of wage and overtime policies. And it would be necessary for you to keep two sets of records for your own protection.

If there's a union, the law won't make any difference anyway, as a practical matter. No union would be willing to write a "double standard" into a contract.

If there isn't a union, setting up a "double standard" on wages would be the best ammunition you could give any organizer.

"MANAGEMENT" EMPLOYEES

Of more importance to manufacturers is what's happening to Wage-Hour rules governing executive, administrative, and professional employees. This management group (along with outside salesmen and local retailing workers) is exempt from the law's minimum wage and 40-hour week requirements. But the law doesn't define these jobs. It leaves that up to the Wage-Hour Administrator.

The definitions now in use (since 1942) are not too clear. Now the Wage-Hour Administrator is planning to introduce a revision shortly after Oct. 10.

The revision would:

1. Increase the minimum salary that executive, administrative, and professional workers must get to be exempt from overtime pay rules.

2. Clarify the job descriptions ("duties test") used to determine whether an employee is actually doing executive, administrative, or professional work.

For executives, the minimum salary goes up from $30 to $55 a week. And for administrative and professional workers, it is $75 a week instead of $200 a month.

Here is a summary of how the new duties tests are clarified.

Executive. Must perform true managerial functions. These are defined. Nonexempt activities—for example, a foreman running a machine—must not exceed 20% of the executive's *own weekly hours.* Now the rule limits nonexempt work to 20% of weekly hours worked by nonexempt workers under the executive's supervision. This change is all to the good. It takes account of total hours worked by supervisors, thus gives a fairer measure.

Administrative. Definition states work must be of substantial importance in the management of a business. And nonexempt work must be limited to 20% of his weekly hours. There is no provision now for nonexempt work.

Professional. Work must require an advanced knowledge in a field of science or learning, or creative activity in an artistic field. Nonexempt work is limited to 20% of the employee's own weekly hours. Also, as in the case of executives, nonexempt work is now limited to 20% of weekly hours worked by nonexempt employees.

It is clear that the new rules aim to simplify interpreting and administering the law. But even more important, there is also to be a a "shortened" test of duties that should be a great boon to employers. The Wage-Hour Administrator will be more liberal in exempting workers earning at least $100 a week—provided a major part of their work fits the definition of duties of an exempt employee.

The value of this shortened test will depend mainly on one point: how much exempt work must be done to make it a "major" part of an employee's duties.

Improper classification of exempt and nonexempt workers has always been a troublesome problem for manufacturers. The reason: You can build up big liabilities fast if much overtime is worked—even if the overtime is voluntary.

With all the potential liability that is involved, the new regulations are nothing to be casual about. The best rule to follow:

Make a person-by-person survey of your whole management payroll. Hold tightly to the new regulations—both as to salary and primary-duties tests. Remember that the job should be done as carefully as you think an inspector of the Wage-Hour office would do it. Don't forget that inspectors have the authority to examine your records and observe the work of exempt personnel if they choose.

Seventeen Ways to Cut the Cost

You can greatly increase efficiency, life, and dependability of your storage batteries by applying the seventeen simple procedures outlined below

K. A. VAUGHAN • MANAGER, FIELD ENGINEERING, GOULD STORAGE BATTERY CORPORATION, TRENTON, N. J.

1. Be sure your batteries have proper capacity for the job

Batteries for cycle duty, as in electric trucks, should be specified according to the capacity-recommendations of the manufacturer of the equipment to be served. There is often a tendency to substitute a smaller-capacity battery because superficial surveys indicate it will do the job. However, it must be remembered that the battery must supply power for peak-demand operations at any time during the shift and that extra uses invariably are found.

Substituting a smaller battery almost always results in its being overworked. That overdischarges the battery and results in lower efficiency. Over a period of time battery elements are inevitably damaged, with the result that maximum available life is not realized.

Availability of a sufficient number of batteries also is important. As a guide, 2.1 batteries per truck can be used as the minimum required for three-shift operation, provided available charging equipment can recharge each battery in eight hours.

2. Give battery tenders complete instructions

Put one man in complete charge of charging operations, to centralize authority and responsibility. He should be well versed in battery technology and understand charging and maintenance procedures.

Some battery manufacturers conduct schools for customer employees and maintain capable field engineering staffs that are available for consultation on battery problems.

3. Make periodic inspections

The simplest way to keep cycle-duty batteries at maximum efficiency is to establish a periodic maintenance and inspection schedule. The battery should be cleaned from once a day to once in several weeks, depending upon the atmospheric and other conditions under which it operates. Water must be added to replace that lost by evaporation once every one or two weeks when the battery is in full cycle service.

The specific gravity and voltage of each cell of the battery should be checked at least once every three months, preferably once a month, after an equalizing charge. (See No. 11.)

4. Keep accurate records of charging and repairs

Records of all charging and maintenance activities for both cycle-duty and stationary batteries should be made and filed to form a case history of the battery. Such records show which batteries are being abused or are wearing out, and make it possible to take steps to correct abuses or replace units in time to prevent production stoppages. From these records troubles in operating equipment, charging equipment, and charging schedules often can be diagnosed.

Also, the men handling battery maintenance are more conscientious if they are required to record such data as: date of charge; time; amperes; specific gravity at the beginning and end of charge; addition of water.

5. Do not overdischarge any battery

A battery must not be overdischarged, if maximum life is to be attained. Although occasional overdischarge has no harmful effects, if continued, it will harm the plates of the battery and shorten its life. In addition, when a battery nears complete discharge, its operating efficiency decreases.

6. Give boost charge during lull in the duty-cycle

Boost charges occasionally are necessary when trucks are doing extra-heavy work, or working extra hours. To prevent overdischarge of the battery a brief charge is given. This charge should be given during a lull in the work cycle (say, during the lunch period) to prevent unnecessary downtime of the truck.

Although this is not a direct battery-cost saving, it is a plant saving allied with battery operation.

7. Locate charging stations strategically

Considerable savings can be made in over-all plant operation if charging stations are located strategically. In large plants, it can be advantageous to situate small charging stations in outlying departments.

If central charging is used, the charging station should be situated so that all trucks have approximately equal distances to travel for charging.

Central charging has the advantage that it is more easily supervised. If conditions call for spot charging, proper supervision is extremely important.

# of Operating Storage Batteries

8. Schedule charging operations to avoid excessive downtime

It is particularly advantageous to schedule charging operations where a large fleet of trucks is employed, or where more than one shift is worked. By assigning each truck a certain time to report for charging, a backlog will not pile up at the charging room and truck downtime will be minimized.

9. Control charging

Although charging equipment is largely automatic, it must be correctly set for the size of battery charged. If a voltage relay timer governs the charging period, it should be inspected frequently to be sure it is in good operating order.

If the ampere-hour method of controlling the charge is used, charging men must be thoroughly familiar with ampere-hour-meter charts, and must be made to utilize them correctly. Otherwise, the battery will be either overcharged or undercharged.

10. Do not overcharge the battery

A cycle-duty or a stationary battery should not be overcharged, because this results in gassing and overheating. Gassing causes loss of water from the electrolyte. The practice of consistent overcharging will have permanent ill effects on some of the elements of the battery.

11. Give equalizing charges periodically for full charge

An equalizing charge should be given to cycle-duty and stationary batteries at least once a month, but not more often than once a week. This is an additional charge of three or four hours at the finishing rate of the battery. The purpose is to make sure all cells are brought up to full charge.

12. Inspect all charging equipment and meters

An occasional check-up of all charging equipment, ammeters, and voltmeters should be made. Although serious inaccuracies in this equipment will show up during charging, small inaccuracies can go unnoticed and over a period of time will lead to less efficient charging.

13. Keep idle batteries charged

Batteries that are stored for a period of time should be given a freshening charge once every three months to keep them in a fully charged condition. If this is not done, the battery eventually will discharge itself by internal action and a lead sulphate film will form on the plates. If allowed to remain, this film will harden and impair the efficiency of the battery when it is put in use.

14. Repair promptly when necessary

Although seldom required, battery repairs are sometimes necessary because of cracked containers, internal shorts, or rough handling. When inspections reveal a damaged battery, repairs should be made immediately, both to prevent further damage and to bring the battery back to maximum efficiency. This is particularly true with damaged cells. If damaged cells are not replaced at once, the battery does not deliver full capacity and the other cells must stand harder duty to make up for those that are defective.

The battery room foreman should be familiar with repair techniques. A small supply of spare parts, such as jars, covers, and connectors, should be kept on hand.

15. Replace batteries when they drop to 85 per cent of rated capacity

Efficiency drops rapidly after a cycle-duty or stationary battery has been in service so long that it delivers less than 85 per cent of its rated capacity. When this point has been reached it is advisable to replace the battery, to prevent work stoppages and avoid extra charging operations.

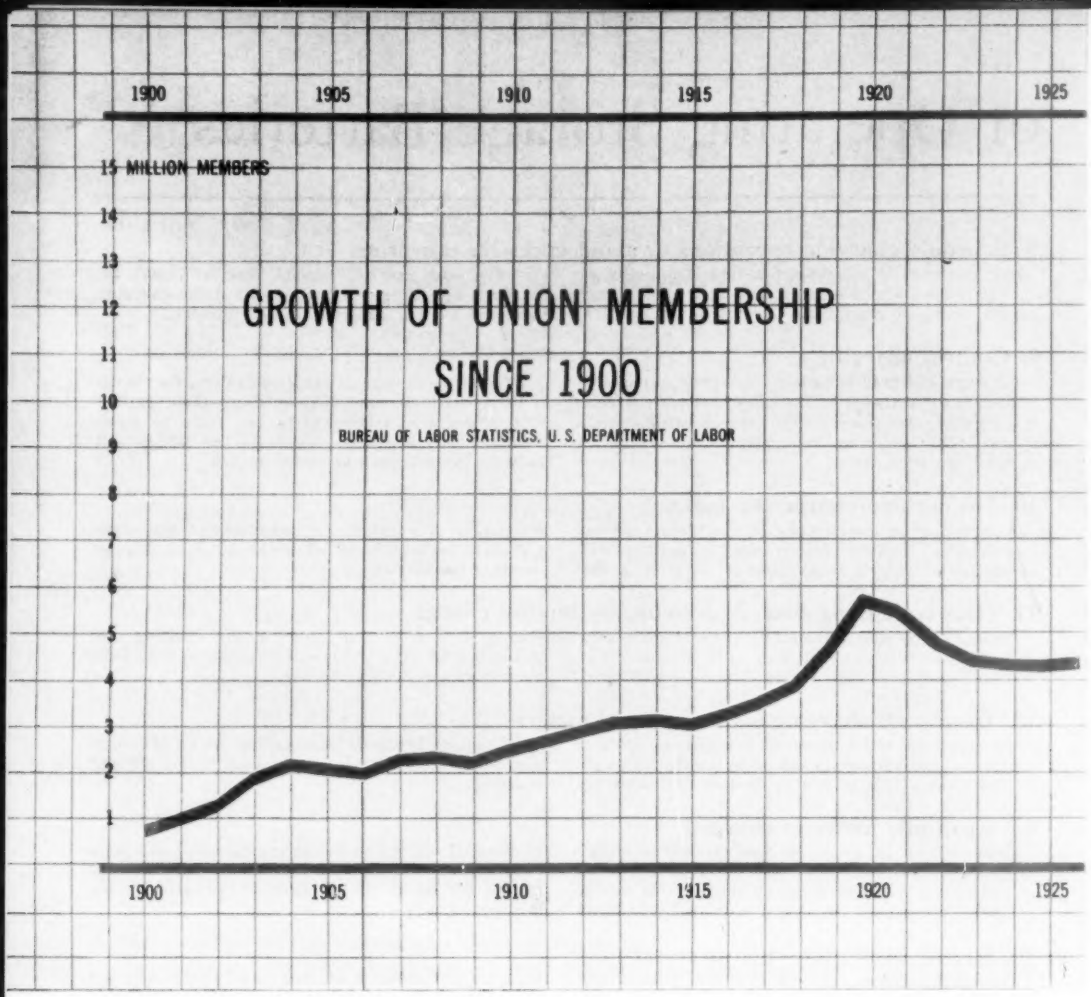
16. Install stationary batteries in proper location

This is particularly important because after stationary batteries are installed they are seldom, if ever, moved. Batteries should get some ventilation and should not be near heat-generating equipment. Adequate room for maintenance operations also must be provided.

17. Schedule regular maintenance for stationary batteries

Individual cell voltages of stationary batteries should be checked and recorded once every three months. If one or more cells are more than 0.05 volts below average voltage, specific gravities should be recorded and the battery given an equalizing charge.

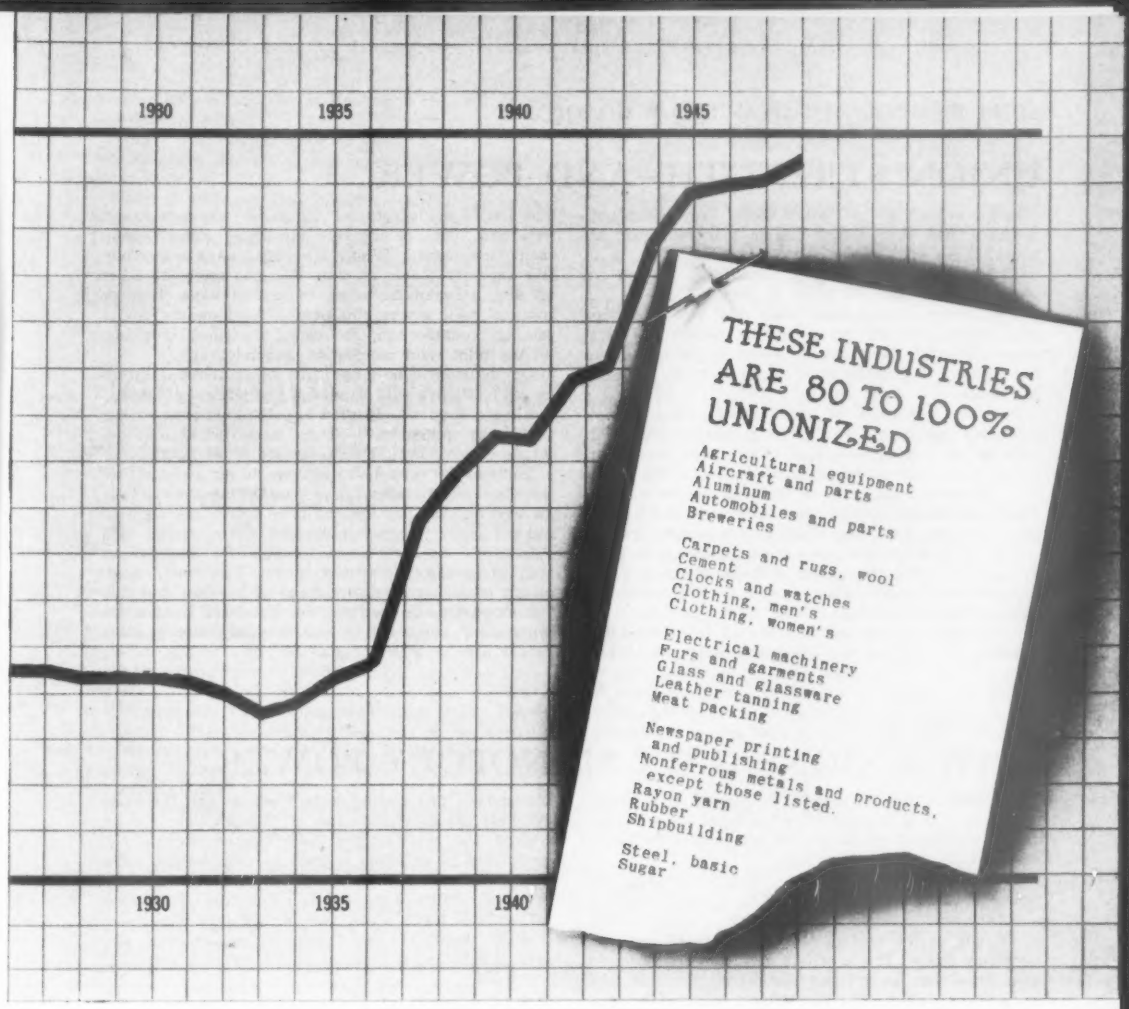
If all voltages are uniform, specific gravity readings need not be recorded more often than once a year. Water need not be added more often than semiannually to batteries that are operating under well-regulated conditions.



Must Big Unionism

Laws have been on guard for decades against abuses of the power of Big Business. Big Business has grown — and served America — under these anti-monopoly laws . . . Now Big Unions are getting monopoly power. Abuses of that power are a threat to the nation's economic health

This article tells how union monopoly power has grown, some of its consequences, how to detect its beginnings. Next month: How we can curb labor monopolies—and live with Big Unions



Mean Labor Monopoly?

M. J. MURPHY • ASSOCIATE EDITOR, FACTORY

THE UNION-MEMBERSHIP LINE in this chart is not likely to slide much—if any. Big unionism is with us to stay. As a plant-operating executive, you can't afford to figure any other way.

But that doesn't mean that the country has to tolerate the misuse of big unions' power—any more than it tolerates cartels.

We must find ways to check labor monopolies, just as we devised anti-trust laws to check business monopolies. There are ways to do this job. But before we try to work them out, let's take a look at the labor-monopoly problem—*how it got that way, how bad it is, how bad it could become.*

This month a Senate committee is probing the situation. It will make some headlines—but probably not much else, unless an alert public demands that its interest be protected.

FACTORY's analysis—which begins on the next page—is designed to help you set your sights on the problem and its background, so that you can help translate headlines into a type of action that will promote a better balance of power.

Continued on next page

UNION STRENGTH—AND POWER

Labor unions in the United States are bigger and stronger than ever before. From a membership of 2 million in 1932, organized labor has grown to a total of more than 15 million members. It's easy to visualize 20 million in years to come.

The leaders of organized labor now have the biggest single pressure group in the nation at their command—and the group is going to be bigger in the future. This is the crux of the problem of labor monopoly.

The vast expansion of union membership and of collective bargaining has given a small number of men in labor a concentrated power that has never before been enjoyed by private citizens in this country. Moreover, the laws of the land are so written (and read by the courts) that these men are free of the anti-monopoly rules that govern business.

The whole situation is an open invitation to grab for power. That the power may be misused is an ever-present danger. *That it often has been misused is a matter of record.*

An idea of the extent of some of labor's empire building is given by the Bureau of Labor Statistics. The list of manufacturing industries where between 80% and 100% of workers are under union agreement is a regular Who's Who of American productive capacity (table above). Also, an impressive list of key nonmanufacturing industries have 80% or more of their workers unionized—coal mining, metal mining, construction, railroads, maritime, trucking, airline pilots and mechanics, and telegraph.

Obviously, it is no longer just an academic question to ask: "What would happen if the leaders of American labor suddenly decided to call concurrent strikes in all key industries?" There is no doubt that the whole country would be prostrate in 24 hours.

To keep the record straight, we do not believe that labor's current leadership is considering such action. In terms of the law, unions have had every right to expand their organizations and their power, and FACTORY does not criticize them for doing what they are legally permitted to do. FACTORY does, on the other hand, deplore many of the *uses* to which labor's power has been put. And it fears, in common with many segments of our economy, the possible *future* uses to which it may be put.

HOW UNIONS GAIN MONOPOLY POWER

Actually a labor monopoly is created on a small scale every time a union wins the legal right to represent a group of workers. The law makes the union the *exclusive* bargaining agent.

The original idea, of course, was to equalize the power of labor and management by giving the union a corner on the labor market within a plant.

As long as the parties remain relatively equal in economic power, this is a fair method. If the union goes on strike or imposes restrictive practices, the public may suffer. But the effects of troubles in a single plant are rarely serious or widespread. The real test of a monopoly is whether the public is denied commodities or services that are essential to the national or regional economy.

The pressing question that has been before Congress and the nation is not the status of the individual plant and union. The trouble comes from multiplication of small monopoly power to cover many plants and industries, regionally and nationally.

There are three stages to the growth of the power of a labor monopoly from small beginnings.

1 • Growth in Size

As a union's scope spreads, its power grows. The typical pattern for an industrial union is therefore to seek recognition in all the plants of a company and in all the companies of an industry. The Rubber Workers and Textile Workers are good examples of unions using this progression. Other big industrial unions go even further, by expanding coverage to suppliers, fabricators, and sub-contractors of key industries. The United Auto Workers and the Steel Workers are good examples of this practice.

Even the craft unions have broken down strict craft lines in an effort to enlarge their power. The mighty Teamsters Union, for example, has tried to organize retail and warehouse employees. If successful on any large scale, this would give the union strategic control over transportation, storage, and sale of substantial portions of the nation's goods.

2 • Growth of Personal Power

As union leaders increase their personal power, their unions gain monopoly power. For this reason, these leaders must be skilled politicians—as most of them are. The aim is to weld the union's membership into a close-knit, obedient group that will follow topside instructions.

Once the leadership is firmly entrenched, it is able to go ahead with confidence in its economic power. It can be certain that members will strike or slow down or do pretty much anything else they are ordered to do. The classic example of perfect discipline is, of course, the United Mine Workers, under John L. Lewis. The United Steel Workers, under Philip Murray, is almost as good an example. So are the Clothing Workers, the Teamsters, and almost all the big craft unions.

3 • Growth of Political Power

As union leaders' personal power grows, so does their political power. Union members are voters and taxpayers. This is powerful ammunition that their

leaders can and do use in dealing with local, state, and federal officials.

Almost everywhere there is plenty of evidence of labor's great interest in this particular shortcut to greater power.

Political strength also permits labor to go after benefits that are hard to get by collective bargaining. Demands for laws covering housing, a national health plan, and better social security are just a few of many major goals no longer sought only at the bargaining table.

More to the point, however, is the subject of labor monopoly itself. Labor is strong enough to feel fairly safe even against recurring Congressional investigations of monopolies. At present, both the House and the Senate are conducting investigations. The House committee is concentrating on business monopolies, however, and giving scant attention to labor. The Senate committee is touching nothing but labor monopolies, but there is little serious hope for legislative action. Close observers regard the subject as full of "political dynamite."

HOW UNIONS USE MONOPOLY POWER

Broadly speaking, there are four ways in which unions have made use of monopoly power.

1 • Pattern Bargaining

The aim of pattern bargaining is to enforce uniform contract terms throughout one or more industries or regions. Most public attention is usually given to wage and welfare demands. But nonmonetary contract terms (grievance and arbitration, seniority and layoffs, production standards) are often of equal importance.

Where industry-wide negotiations are the rule, pattern bargaining is inevitable. But it is not limited to industry-wide bargaining. Take steel. Here the union presents standard demands to individual employers. It's much the same in the automotive industry, which does not practice industry-wide bargaining either.

In such cases, the union's big problem is to keep locals in line. Headquarters often does this by having international union representatives keep close watch over negotiations. Also the central office insists on approving locals' contracts.

One of the big criticisms of pattern bargaining is that it works hardships on some companies by ignoring their individual problems. Labor's argument is that employers were following the leader in granting wage increases long before they had unions.

"There is therefore nothing unusual about what we are doing," union leaders reason.

They have a stock comment: "We are not going to subsidize the inefficient producer by giving him more favorable terms than anyone else."

Many employers argue that pattern bargaining artificially inflates prices by stifling wage competition. They point particularly to the chain-reaction spread of postwar price increases as the result of the so-called "national wage patterns" set by big unions.

Economists are lined up on both sides of this argument over pattern bargaining. So are politicians. What many overlook is this fact: What the practice is called is not important. The key point is that such bargaining is possible only when unions have concentrated economic power.

2 • Concerted Strikes

The concerted strike is the big stick behind pattern bargaining. It is also the most direct and potentially dangerous weapon of labor monopoly. In the hands of a well-disciplined union, it can be devastating.

Few heavily unionized industries have not at some time seen the effects of one or more monopoly strikes. The United Mine Workers is perhaps the worst offender. In fact, the soft coal industry for sometime suffered what was really a concerted strike two days each week. This was part of Lewis's personal program to "stabilize" the industry by cutting down production. One result was that consumers paid more for coal because of the artificial scarcity.

Lewis has no patent on this device. Business firms have been equally guilty. But here's the difference: When a group of business organizations conspire to create a high-price, scarcity market, they run smack into anti-trust laws. There are no comparable laws covering the Mine Workers or any other union.

Other coal strikes have cut off production entirely. Some have been so severe that the government seized the mines to start production moving. In the long run, this didn't change the outcome. Lewis got what he wanted from government officials.

In the nation-wide railroad strike of 1946, President Truman expressed the concern of most of the country regarding concerted strikes. Speaking of union leaders A. F. Whitney and Alvanley Johnston, Truman said:

"It is inconceivable that in our democracy any two men should be placed in a position where they can completely stifle our economy and ultimately destroy our country."

The case of the railroads shows that size is not the whole story in monopoly strikes. Even small unions in key spots can tie up whole segments of the economy. Locomotive engineers are in this class. So are harbor and tugboat pilots.

3 • Restrictive Practices

Like the big dramatic strikes, union feather-bedding and other restrictive practices have received much public attention.

In the craft unions, most of the restrictions have to do with who shall do the work and how much work shall be done.

Membership limitations keep skilled labor in scarce supply, thus push up wage levels. Examples: high initiation fees; refusal to accept new members; and the system of two or more "grades" of membership, which enables the select few to throw out the short-term members when they want to.

Jurisdictional rules also control who shall do the job. Taft-Hartley hasn't solved the problem.

Limitations on output take literally hundreds of

different forms. In the final analysis, they all add up to the same thing: *Less* work gets done.

New York painters, for example, find that their "wrists get too tired" if they use brushes more than 4½ inches wide. And Boston bricklayers can't seem to lay more than 300 bricks a day. This in spite of the fact that a Washington (D. C.) contractor has reported that bricklayers on an incentive plan can lay 1000 bricks or more.

Restrictions on labor-savings methods are also common. A few examples: hand mixing of cement required; spray painting banned; factory-glazed sash forbidden; factory-wired electrical fixtures outlawed. The result: Again the consumer pays—sometimes several hundred per cent more than if the job were done by more efficient methods.

These are just a few random examples drawn from the construction industry, one of the worst offenders. Many other craft unions are guilty of comparable practices.

The big industrial unions, still largely CIO, pride themselves on being relatively free of this type of restrictionism. True. But there are still restrictions among these unions. They just take a different form. For example, there is widespread opposition to the introduction of incentive systems. Organized and unorganized slowdowns are common. The toll they take of output is obvious.

Other restrictions by industrial unions aim at management rights, such as handling of discipline, layoffs, discharges, promotions, and demotions.

Unions didn't invent restrictive practices. They were used hundreds of years ago. What unions *have* done, however, is to spread them to an extent that would never otherwise have been possible.

4 • Direct Participation in Running an Industry

Here is the most complete and best-organized type of labor monopoly. The union has many of the rights of partnership without the responsibilities. It is able to determine basic operating policy of the utmost importance to the industry. And—most important of all—it controls both wage and price structures.

The Amalgamated Clothing Workers of America (CIO) is the classic example of this form of labor monopoly. Amalgamated dominates the men's and boys' woolen suit and coat industry. It represents about 95% of the workers in the industry, in 26 states. Most of the business is done in nine cities, with New York the dominant center.

The industry is a big one. In recent years, more than 1½ billion dollars' worth of men's and boys' suits and coats have been turned out annually.

Amalgamated is in many ways a model union. Powerful, well-managed, wealthy (dues are around $1 million a month), it has a research staff that cannot be matched by any employer in the industry. Its officials are generally esteemed in management circles.

In spite of all the good things that can be said, however, Amalgamated is still a labor monopoly—and a demanding taskmaster to the industry.

In 1939 the union launched a program to stabilize the industry. There were two goals—to standardize production, and to equalize labor costs. The results of stabilization were rigid control of the grades of clothing manufactured and the wages paid for work throughout the industry. Here's the result today:

The union's rates, determined by negotiation with the employers, are identical (grade by grade) throughout the industry. Individual employers have no discretion. And individual workers are forbidden to receive more or less than the negotiated rate.

The prices of all subcontractors in the industry are fixed by the union, not the manufacturers. So are the subcontractor's wages—and even his profit and his overhead.

Amalgamated has imposed restrictions galore on the industry. Here are just a few:

A cutting machine will cut up to 100 layers of cloth. Mass producers would probably cut up to the limit if the union permitted. The union, however, says that no more than 40 layers (plus or minus a few in various cases) may be cut in one operation.

Labor-saving devices and more productive machinery can't be installed unless approved by the union. The union won't approve unless (a) no employee loses his job as a result; (b) earnings of workers on the new operation are no less than they were before; and (c) no harm is done, in other ways, to the interests of the union or its members.

Manufacturers are prohibited by agreement from establishing any new shop without Amalgamated's consent.

Manufacturers can't contract out work to shops not registered with the union.

What is the effect of all the restrictions that the union has imposed? The industry thinks much good has been accomplished. Destructive wage competition has been almost wiped out. Profits have been maintained because increased costs have been passed on to the consumer. But some manufacturers see trouble ahead. *What is going to happen if the public won't pay the prices that result from the high costs?*

How about the consumer? Have his best interests been protected? Here the answer must be "no." The consumer has paid heavily for the harmonious conditions that Amalgamated has imposed on the industry. The lack of competition, and the lack of incentive for development of new methods and new equipment account for this.

As is apparently true of all labor monopoly programs, it is the public that always pays the penalty in the long run.

CONCLUSION

As labor monopolies grow and prosper in various forms and places, problems continue to pile up for industry and the public. These problems are by no means simple. They all involve the basic question: "What is the best way to control labor monopolies?"

The implications of such a question are serious. Controls should not deprive labor of its legitimate rights. Nor should they be allowed to take the form of disguised union-busting.

* * *

There are ways to regulate big unions without breaking them. There are also ways to use the powers of big unions to cure some of the very evils they now foster. These solutions will be discussed in FACTORY's November issue.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

It isn't pensions. Or social insurance. It's who pays for them.

That's what the fourth-round bargaining issue boils down to. A principle.

Truman's steel board urged against another round of wage rate boosts. So you probably won't have to give any. Unless you trade pension costs for higher wages.

Most management feels workers should help pay for welfare benefits. Just as they do under government social security. Workers who now contribute will try to shift their share of the burden to management also.

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Salient features of the board's report to keep in mind in your bargaining:

PATTERN BARGAINING. Practice of letting one big company set the pattern for an industry deviates from the accepted concept of collective bargaining.

SCOPE OF REPORT. The findings do not apply automatically to all. Union should bargain with each company in the light of each company's situation.

COST. The 10¢ an hour (6¢ for pensions, 4¢ for social insurance) is total cost. Subtract any amount you are now paying toward these benefits.

RECOMMENDATIONS. Board's findings are not binding.

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Communist-led unions won't quit CIO. They'll fight until they're kicked out. A blow-up seems certain this month.

When it comes, the break won't be clean cut. CIO must make a home for the anti-Communist groups in these unions. Also it must try to retain bargaining rights in the industries affected.

This spells trouble in some electrical, metal mining, smelting, farm equipment, food, and other plants.

CIO has served the Communists well since its beginning. Without CIO, Communist activity is sure to suffer. That's why there may be a last-minute maneuver by the left-wing outfits to prevent outright expulsion.

A hint of this possibility comes from John Williamson, C.P. labor secretary. His advice to the Communist faithful: "Fight against a split in CIO; collaborate with workers under right-wing leaders in CIO and AFL."

Williamson admits the Communist objective is to eliminate the capitalist system. He warns: Unions alone can't do it; there must be a broader base, including farmers.

In this left-right fight within labor, control of news flowing into the labor press is important. Up to now, the leftists have had their own way. That's because Federated Press, a daily labor news service, sticks close to the Communist line.

Through a revitalized Labor Press Association, anti-Communist unions hope to take over news coverage for most labor papers.

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Senator Taft's re-election next year seems certain. Democrats and labor leaders can't find a strong opponent both can support.

Ohio Democrats won't accept labor's first choice, Murray Lincoln. He's a farm bureau and co-op leader. Also Republican. Our guess: He won't run. If he does, he won't be nominated. Cleveland's Mayor Burke is a long-shot entry. Governor Lausche could beat Taft. Always unpredictable, Lausche may change his mind about not running.

Failure of combined labor groups to elect Mrs. Coffey to Congress from labor-strong Johnstown, Pa., has taken some of the wind out of labor's political sails.

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Labor's political leaders look for the Senate labor committee to toss up ammunition for next year's congressional races. The committee has $25,000 to study labor-management relations. Most of it will go to make Taft-Hartley look bad, help organized labor's campaign to repeal it.

Taft-Hartley won't be changed before 1951. So it's important to know what meaning NLRB and the courts give to the law's language. Some recent rulings:

UNION SHOP. Without an NLRB poll, you can't sign a union shop contract even though there is a deal with the union not to enforce it. It's illegal, says NLRB.

SUPERVISORS. The U.S. Circuit Court of Appeals has broadened NLRB's definition of supervisors who are exempt from Taft-Hartley. It includes workers who perform only some supervisory tasks, only some of the time.

FREE SPEECH. In recognition election campaigns, you may explain your business situation to the workers. You may warn them they may lose income through strikes and union rules against overtime work. This you can't do: threaten to lessen your efforts to get business.

DISCHARGES. You and the union can be made liable for lost wages if you fire a worker on union demand when your union shop contract has not been legalized. You can fire a worker who, because he disliked his foreman, got up a petition to have him fired.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Business has clear sailing through December—barring long strikes or other economic calamities.

Retail sales are perking. Appliance makers, for example, are allocating some small items. Fall sales may not break records, but 1949's total will stack up well against last year. Industrial production is gaining strength. Construction promises to top last year by 5%.

But there are still big questions in the 1950 business outlook. The most important: What will industry spend for new plants and equipment?

General business—the economic record shows—is geared to industry's capital expenditures. As capital expenditures go, so goes prosperity.

The 1950 question hangs on profits: 1949 earnings are expected to be 20 to 25% under 1948. And two-thirds of industry's new plants and equipment have been financed by profits.

However, the profits picture—and the prospects for capital expenditures—aren't as bleak as these figures suggest.

Last year's earnings included a lot of paper profits made on rising prices of inventories. Those paper gains did business no good—they couldn't be used to pay for new plants and equipment. But business still paid a tax on them at 38 cents on the dollar.

Last year, too, corporations had to find $8 billion in new money to finance their growing inventories and customers' accounts.

This year business has taken paper losses as prices of inventories fell. That cuts the tax bill. But, in addition—by selling off inventories and holding down receivables—business has accumulated cash. In the first half of the year corporations worked off $1.7 billion of inventories and $3.1 billion of receivables. With that cash they paid off $2.1 billion of bank loans. But they still had nearly $3 billion in new cash with which to finance inventories and receivables in the second half.

In short—on the books—the profit picture will look bad this year as against last. But the tax bill will ease and many companies will actually have more cash than they had a year ago. And business will be able to put a bigger share of 1949 profits into new capital equipment.

Even Wall Street is taking a cheerful view of 1949 profits. The market has been rising. Investors would rather see $1 of real profits than $2 of paper earnings.

This picture varies from company to company, of course. But—for business as a whole—the 1949 profits story is a lot better than it looks.

Traders and businessmen around the world are still shifting gears to meet changes brought by sterling devaluation.

But two things stand out:

1. Except for a few cases, American business probably will gain more than it loses.

2. Devaluation gained the British breathing space. But it sharply increases the pressure on them to tackle their basic problem—inefficient plants and high-cost production.

It will probably be a year before economists can add up the world's gains or losses from the devaluation gamble. Britain clearly gains in the short run. Her gold and dollar reserves will gain. Her manufacturers have sharp incentives to tackle the American market.

But Britain also is jolted sharply. She will have to pay more—as much as 30% more in some cases—for the essential one-fifth of her food, raw materials, and industrial equipment that comes from the United States and Canada. On the other hand, her income from dollar sales is cut. The result: lower living standards for Britain.

Britain's fate hangs on how much its industry can cut costs and expand sales.

The United States is seeing both gains and losses, but the gains probably outweigh losses. Raw materials from the sterling area—coming in at the rate of almost $800 million a year—may be cheaper. British manufactured goods were coming in before devaluation at the rate of only $200 million a year. Devaluation, even after price increases, will make some British products more competitive. But—sharp gains in American use of sterling raw materials will come more from expansion of U. S. industry than from price cuts. And Britain—which shoots generally at luxury markets, anyhow—seems to have a long, hard haul to expand sales of its manufactured goods sharply.

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Political repercussions—with a general election coming up—may well overshadow the economic effects of Britain's devaluation. A swing to the right in British politics, for example, would clear the way for more American investment in Britain.

●

Productivity in manufacturing may be slightly better than it has looked. Bureau of Labor Statistics has revised its employment estimates, now shows non-farm employment in June at 42.8 million. That is almost a million less than earlier estimates showed. It means the United States is turning out the goods with fewer workers than experts calculated.

Job Shop Production Control With Less Paperwork

Accurate control system based on permanent master sheets involves minimum of paperwork. Data is reproduced on four control forms directly from masters

SIDNEY C. LUMBARD • PRODUCTION DIVISION MANAGER
EDWARD ERMOLD COMPANY, NEW YORK

A NEW SYSTEM at Edward Ermold Company assures close control of materials and production. Tie-ups resulting from parts bottlenecks are rarities. Data on quantity and location of all parts are available at all times. Records for 3000 parts are uniform and accurate. And parts inventory is kept at an economical level.

The system is based on master methods sheets. From these master sheets are duplicated the four forms—and the necessary copies of each. In the case of two of the forms used, copies may number 30 or more.

The company manufactures automatic labeling machinery and container handling equipment. Much of this machinery is made to customer specification. As many as 1000 production orders per month may be involved. Control forms must therefore provide necessary methods information for manufacture of all parts. An accurate rule for keeping track of cost per operation instead of by the entire job has resulted. So well does this system function that time spent by auditors in physical inventory test checks has been cut 50 per cent.

Ermold stopped using its former control system and started fresh. New forms were developed to include all desirable information. The diagram on the following pages shows what forms are used in the system and how they are routed.

A master methods sheet is prepared by the production engineering department for each part manufactured by the company. Some 3000 of these master methods sheets are filed in the production control department. When a part called for in a bill of materials is out of stock, the scheduling section of production control issues a production lot order, using the appropriate methods sheet as a duplicator master.

Data on this master copy are reproduced on four forms and their duplicates:

1. Material Requisition.

a. Release copy—used to pre-post production lot order to material control record.

b. Raw stores copy—stores department's record.

c. Receipt copy — withdrawal-from-stock control. Most important copy of the form. It verifies preposting to the material record and is then sent to cost accounting.

d. Dispatch copy — dispatcher's record of transaction.

2. Production Lot Order. Starts job through manufacture. Acts as methods sheet for each operation:

a. Cost accounting copy—acts as job start ticket. Tells cost accounting job is ready to start.

b. Planning and scheduling copy —records manufacturing progress in production control department.

c. Dispatch copy — dispatcher's job record.

d. Shop copy traveler—Most important copy. It acts as master methods sheet at each operation. Follows job through entire cycle. Acts as inspection record. Acts as move ticket from inspection department to stores. Close-out posting medium from material control to cost accounting.

3. Dispatch Control Card. One copy is made for each manufacturing operation. Dispatcher uses it for machine loading. Returned to planning and scheduling section for progress reporting.

4. Job Time Card. One copy is made for each manufacturing operation. Timekeeper uses it to report time spent on the operation. Sends to cost accounting for job costing.

Each time a master copy is used, new account and lot order numbers and scheduled quantities are entered on it.

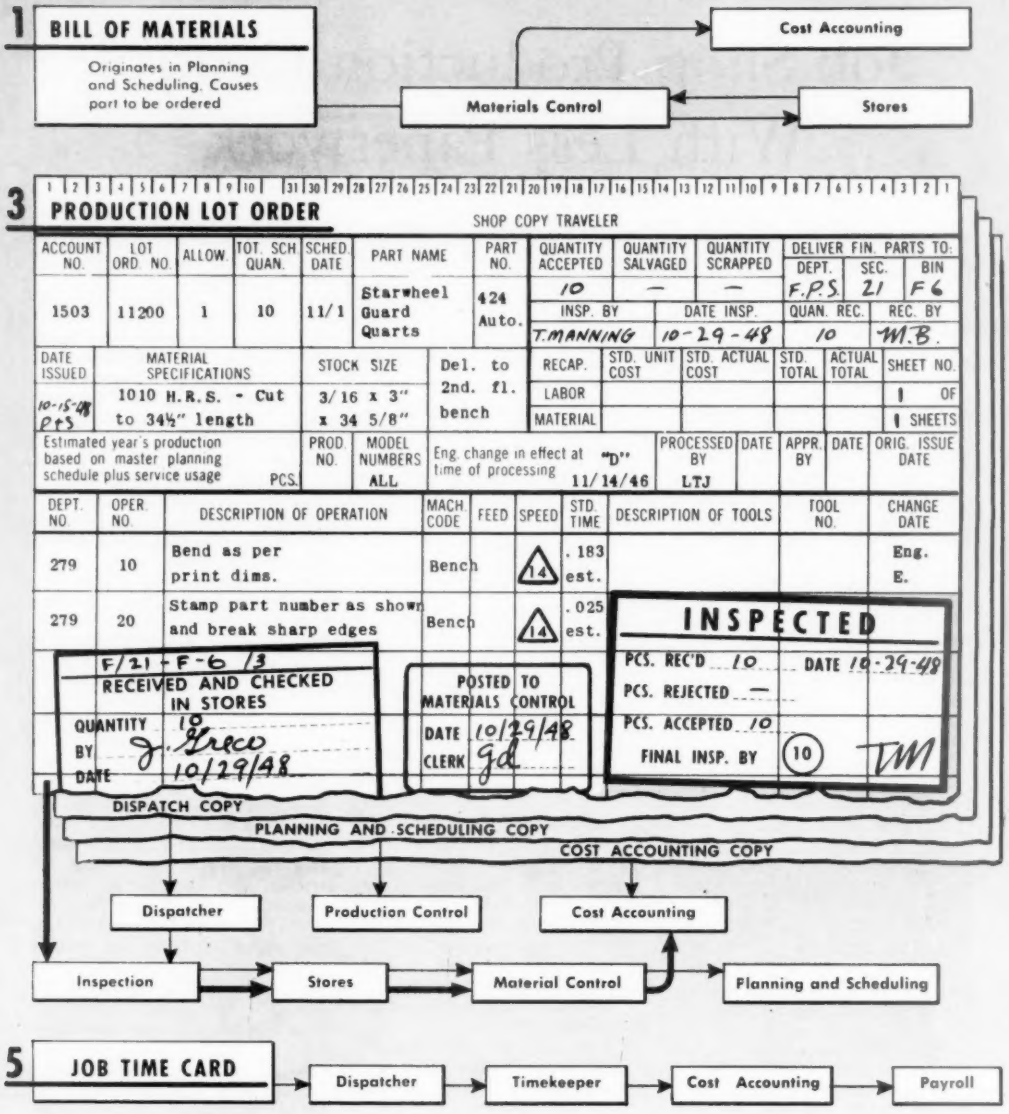
The materials control section receives the release copy of the materials requisition from the scheduling section. Upon receipt, the release copy is posted to the applicable material control record. Under "Remarks" on the release copy is posted the stock balance from the materials control record. When material is on hand, this form goes to planning and scheduling.

The planning and scheduling section files one copy of the production lot order. A progress-date tab is kept on this copy. Planning and scheduling encloses in a plastic envelope the production lot order—shop copy traveler, dispatch copy, dispatch control cards, raw material requisition, and job time cards. This envelope is sent to the dispatcher, who controls the manufacturing cycle from this point on.

When the job is ready to run, raw stores, dispatch, and receipt copies of the materials requisition are sent to the designated stores area. The storekeeper inserts carbons between copies and makes an entry to remove from stock the quantity specified. He then enters "actual count." The raw stores copy is filed as evidence the requisition has been filled. Dispatch and receipt copies are forwarded with the material to the dispatcher.

On receipt of the material and the dispatch and receipt copies of the material requisition, the dispatcher inserts carbons between the copies, enters the actual count of the material received, and initials the form. The dispatch copy is stapled to the dispatch copy of the production lot order. The receipt copy is sent to materials control.

Materials control reconciles the records with the actual count


1
BILL OF MATERIALS
Originates in Planning and Scheduling. Causes part to be ordered
Cost Accounting
Materials Control
Stores
3
PRODUCTION LOT ORDER
SHOP COPY TRAVELER
ACCOUNT NO. 1503
LOT ORD. NO. 11200
ALLOW. 1
TOT. SCH QUAN. 10
SCHED. DATE 11/1
PART NAME Starwheel Guard Quarts
PART NO. 424 Auto.
QUANTITY ACCEPTED 10
QUANTITY SALVAGED —
QUANTITY SCRAPPED —
DELIVER FIN. PARTS TO: DEPT. F.P.S. SEC. 21 BIN F6
INSP. BY T.MANNING
DATE INSP. 10-29-48
QUAN. REC. 10
REC. BY M.B.
DATE ISSUED 10-15-48 pts
MATERIAL SPECIFICATIONS 1010 H.R.S. - Cut to 34½" length
STOCK SIZE 3/16 x 3" x 34 5/8"
Del. to 2nd. fl. bench
RECAP. / STD. UNIT COST / STD. ACTUAL COST / STD. TOTAL / ACTUAL TOTAL
LABOR
MATERIAL
SHEET NO. 1 OF 1 SHEETS
Estimated year's production based on master planning schedule plus service usage PCS.
PROD. NO.
MODEL NUMBERS ALL
Eng. change in effect at time of processing "D" 11/14/46
PROCESSED BY LTJ
DATE
APPR. BY
DATE
ORIG. ISSUE DATE
DEPT. NO. / OPER. NO. / DESCRIPTION OF OPERATION / MACH. CODE / FEED / SPEED / STD. TIME / DESCRIPTION OF TOOLS / TOOL NO. / CHANGE DATE
279 10 Bend as per print dims. Bench 14 .183 est. Eng. E.
279 20 Stamp part number as shown and break sharp edges Bench 14 .025 est.
F/21 - F-6 /3
RECEIVED AND CHECKED IN STORES
QUANTITY 10
BY J. Greco
DATE 10/29/48
POSTED TO MATERIALS CONTROL
DATE 10/29/48
CLERK gd
INSPECTED
PCS. REC'D 10 DATE 10-29-48
PCS. REJECTED —
PCS. ACCEPTED 10
FINAL INSP. BY (10) TM
DISPATCH COPY
PLANNING AND SCHEDULING COPY
COST ACCOUNTING COPY
Dispatcher
Production Control
Cost Accounting
Inspection
Stores
Material Control
Planning and Scheduling
5
JOB TIME CARD
Dispatcher
Timekeeper
Cost Accounting
Payroll

PRINCIPAL FORMS—and how they move from one department to another—are shown on this flow chart. Short cuts, like rubber stamped entries on mechanically duplicated forms, help give efficient control at low cost

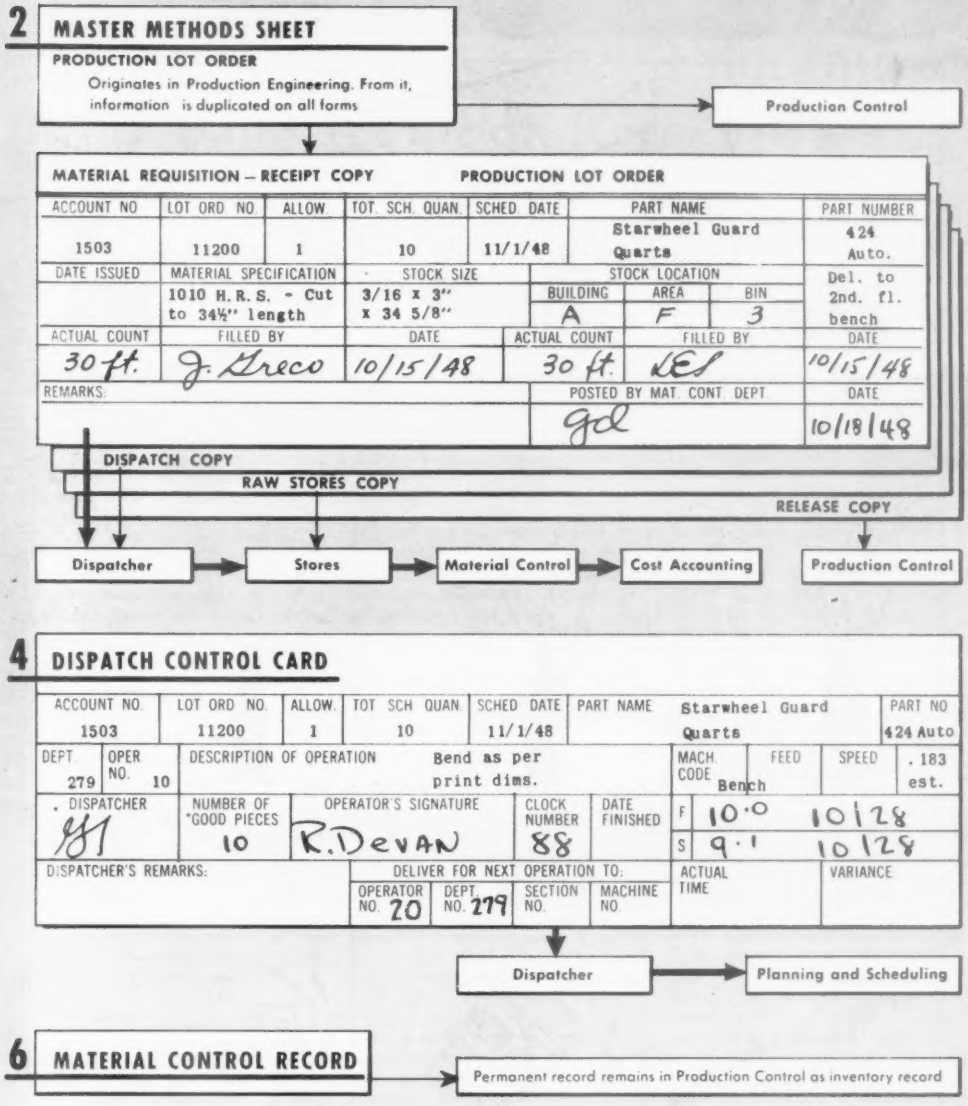
shown on the receipt copy, which is then sent to cost accounting.

As soon as the material is received from rough stock stores, the dispatcher removes the applicable production lot order in its plastic envelope from the pending file. The dispatch copy of the production lot order, dispatch control cards, and job time cards are placed in the open file until ready for assignment to the first operation.

Upon assignment to an operator, the shop copy traveler and part engineering print are placed with the material in work and remain with it.

When the last processing operation has been completed, the operator sends the envelope intact to the dispatcher. He removes the dispatch copy from his follow-up files, removes tab signals, and inserts it in the envelope. He then assigns the envelope to the stock mover, who moves materials to the inspection department.

After inspecting the material according to the part print taken from the envelope, the inspector re-

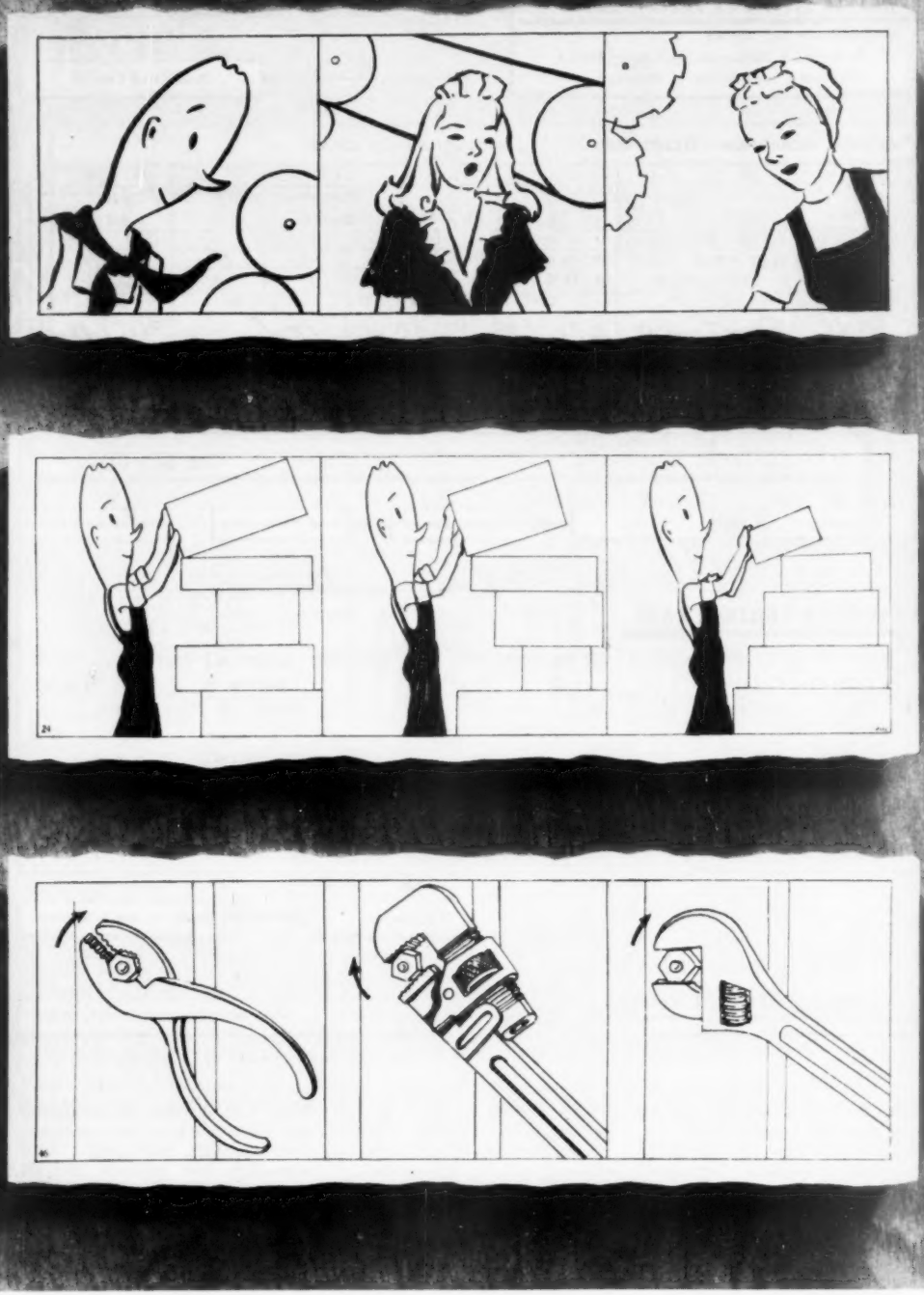


moves the traveler and the dispatch copy from the envelope and then enters on both copies, in the spaces provided, "quantity accepted," "quantity salvaged," "quantity scrapped," and "inspector's stamp number." At this point, standard procedures for handling rework and scrap are followed.

Inspection then forwards material and the envelope to the finished parts stockroom. Traveler and dispatch copies of the lot order are stamped with quantity received and envelope and all enclosures are then sent to materials control.

After removing all forms from the envelope, materials controls posts to the material control card the quantity received. The shop copy traveler is sent to cost accounting, the dispatch copy to the scheduling section.

Upon receipt of the dispatch copy, it is analyzed by production control supervisors for variations from standard performance, with respect to the quantity of good pieces, quantity of scrap, quantity of rework, total schedule time, and operation time, to determine changes which may be required before the next lot can be run. After deviations have been noted, the dispatch copy is filed with the planning and scheduling copy.



RIGHT AND WRONG ways of doing the job are shown in Revere safety test. Company rates employees on ability to spot violations, using 57 test panels like these to check wide range of safety rules

Safety Testing and Training Cut Accident Rate 31%

Everyone taking Revere's picture test becomes his own safety teacher. Analysis of his answers aims corrective action in the right direction

M. De MILT AIRD • SUPERVISOR OF TESTING, GENERAL INDUSTRIAL RELATIONS DEPARTMENT, REVERE COPPER & BRASS, INC., ROME, N. Y.

CURIOSITY HELPS in putting over Revere's safety test and training program. Those who take the test naturally want to find out their mistakes, so they look up the applicable rules in a safety booklet given them by the company. Instruction that they give themselves in this manner is supplemented by a follow-up training program, including an indoctrination lecture by the plant safety engineer and talks by their respective foremen.

Results show that the accident frequency rate has dropped 31 per cent, from 12.9 to 8.8, in the last three years, even though the test and subsequent training has been the only major change in the company's over-all safety program. During a test survey period, 89 first aid calls per thousand employees were made by those who had not taken the test. In the same period, only 54 calls per thousand were made by the group tested. Since the company insists that all injuries be reported to first aid, these figures show that the second group actually had fewer accidents.

What the Test Consists of

The test contains pictures illustrating the right and wrong way of performing various tasks, as dictated by safety rules and regulations. Some of the situations are based on common sense, but in other instances it is necessary to know a specific safety rule.

The first section of the test is devoted to general safety—items that apply to any individual whether or not he is in an industrial situation. The second section on piling and carrying extends into the general industrial situation, where common sense combines with knowledge of general industrial safety practices. Section three is based on the use of tools and requires general knowledge, plus familiarity with rules common to machine shops. The final section is devoted to industrial machines.

The quiz is administered to employees either singly or in groups, and 20 minutes are allowed for completion. The company tries to avoid giving the test during periods when the individual may be fatigued or under stress.

Before actually applying the test, it was validated in co-operation with Syracuse University. An experimental form was administered to about 10 per cent of the employees in the eight divisions of the company. The average score of workers who had been accident-free was significantly higher than that of workers who had had one or more accidents.

These results have been confirmed in actual application of the test during the past three years. It has been found that lost-time individuals as a group score 5 points lower than employees who have had the test and subsequent training based on test results.

The safety test is based on the premise that it is advisable to measure the individual's specific needs for safety instruction before attempting to train and advise him. The technique is designed to make definite goals available rather than to make use of the scatter technique of generalized talks and posters in the hope that "something will get through." Other advantages are:

1) Allowing the safety instructor to conserve his efforts.

2) Checking the efficiency of safety instruction.

3) Psychological effect on the person testing—arousing curiosity and emphasizing the company's interest in his welfare.

4) Elimination of those who appear completely unteachable. Below a certain critical score, individuals are not accepted for the training program, as experience has shown the attention they require is rarely effective.

5) Measuring accident-proneness.

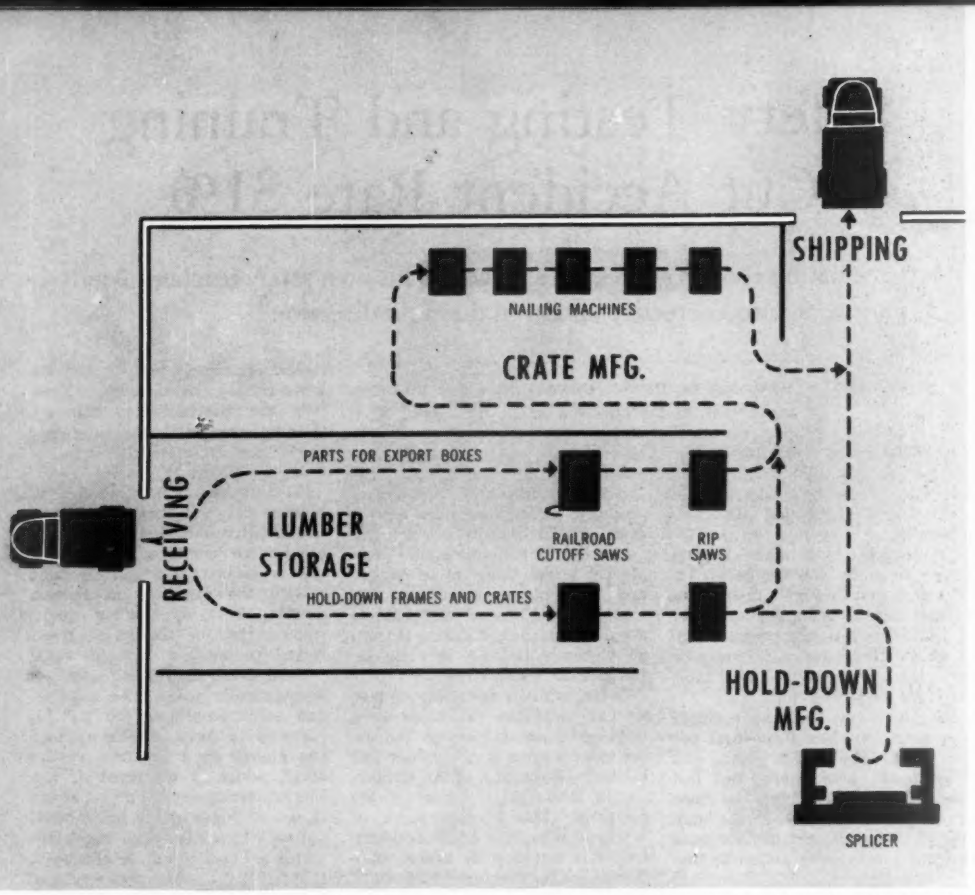
Other uses may be made in particular situations. For example, a prospective employee headed for the pressroom is found to have missed the question on Poisson guards. This information might suggest that he should be transferred to another type of work.

Testing the individual does not automatically make him a better and safer employee. To put his curiosity to work, all his answers are placed on a separate answer sheet, which is corrected in red. The answer spaces are keyed directly to the pages in the safety manual on which rules applying to his errors are spelled out. At this point it is felt that the employee becomes his own safety instructor. He wants to find out why he was wrong and will look up the rules.

However, before he is turned loose as his own instructor, the safety man and foreman to whom he is assigned both review his results with him and consequently become informed of and responsible for phases of safety in which he is weak. The safety man or instructor gives an indoctrination lecture to the new employee. This is followed by three on-the-job instruction periods by his foreman.

Those who do not meet a certain critical score must be retested before they are finally attached to the permanent payroll. At this point it is easily seen how effective the instructions of the safety engineer and foreman have been.

By psychological pressure to "find out how I made out," the safety instruction staff of the individual has been increased by one—himself. At the same time, it has been made possible for the safety engineer to concentrate his teaching efforts.



NEW LAYOUT eliminates backtracking by providing logical production sequence. Incoming materials are fed, in two lines, directly through manufacturing processes to shipping department

Complete Relayout Halves Production Time

Average unit production time for wooden crates, boxes, and frames was 18-20 man-minutes. Complete relayout cut those figures to 8-9 man-minutes

E. G. AHLMAN · MAINTENANCE MANAGER, WILLARD STORAGE BATTERY COMPANY, CLEVELAND

FIFTY DIFFERENT TYPES of wooden crates. One hundred sizes and shapes of wooden boxes. Over 100 different "hold-down" frames. All made in an area of only 23,000 square feet at Willard. Construction time now averages between 8 and 9 man-minutes per container. Formerly, it was from 18 to 20. The reduction has resulted from a relayout of manufacturing facilities in a more logical production sequence. It was made possible by moving the entire operation into a new building adjacent to its old location.

Rapid growth of our business caused the department to take on a totally "unplanned" look. As new machines and equipment were added, they were placed in whatever space was available. Flow

RAW LUMBER, taken from storage bins in background, is sized on railroad cutoff saws. Operator in right foreground does further sizing on rip saw, as pieces start down line to crate department

lines crossed and recrossed. Backtracking increased, and the whole handling picture became confused. Obviously, production suffered.

When we reached the point where the number of board feet of lumber handled daily approximated the requirements for an average five-room house, we decided that a complete relayout of the department was in order.

Same Space, Better Planning

The building to which we moved provided no more space than before. By planning the new layout "from scratch" we were able to minimize crossing of flow lines and backtracking and we also reduced temporary storage to a remarkable degree.

Lumber is now received directly at the unloading platform from a truck supplying approximately 12,500 board feet of lumber a day. Storage bins for this lumber are located adjacent to the platform, and receive material directly from the truck. On the other side of the bins an operator feeds the boards, in two lines, to a railroad cutoff saw. The line on the right is used for making parts of crates and hold-down frames. The line on the left cuts parts for export boxes. From the cutoff saw, pieces pass to the rip saws. Pieces are then loaded onto dollies, ready for crate and box assembly.

Approximately one day's production is carried on the dollies. This quantity allows extreme flexibility of operation by permitting immediate scheduling of urgently required orders on the proper nailing machines. Thus a supply of boxes does not always have to be kept on hand to fill rush orders.

On the nailing line, three machines are used for end nailing and two for side and bottom nailing. An average lot of 250 boxes is cut in two or three hours and nailed together in three or four hours. Finished boxes and crates are immediately removed from the production area to the adjacent shipping department, where they are placed on trucks for shipment. This procedure improves box quality by assuring that boxes are new when shipped. Formerly, many containers took quite a weather-beating because of outside storage, so that they looked old even before they had been used.

As an added advantage, the new arrangement makes it possible to salvage much of the scrap ripped from box and crate. The scrap is used in the manufacture of the hold-down frames.

HOW DUMORE SETS ITS INCENTIVE STANDARDS FOR

1 Time Study Observation Sheet

STD. PRODUCTION PER HOUR			
STD. RATE PER PIECE 1.31 Min. / SETUP 21.93 Min.	NAME OF PART	Bearing	PART NO. R-426-0083
WAGE GRADE E ALLOWANCE REF. A-1	OPERATION	Inspect	OPR. NO. 10
MACHINE Bench NO.	MATERIAL	N.D. 7502-B-16	DEPT. NO. 10C
TOOLS USED 1" and 2" Micrometer			
T-80-5864 Plug Gage			
Sheffield Shadow Gage – T80 - 7640			
COOLANT - Master			
INSPECTION REQ. DA-1			
TAKEN BY Std. Data APPROVED BY S.S.			

SKETCH OF PART, MACHINE OR WORK CENTER

	ELEMENT DESCRIPTION	FEED	SPEED	STANDARD TIME
A	Select DA-1 sample and unwrap (2-A)			.0452
B	Finger drag test (1) (Include visual inspect)			.1325
C	Inspect width (1)			.1969
D	Inspect I.D. (2)			.1913
E	Inspect O.D. (3)			.3000
F	High speed spindle test			.3151
G	Oil bearings (1)			.0663
H	Wrap bearings (4-A)			.0636
	Standard Min./Pc.			1.3109
	Setup: Prepare and Report			8.8541
B				.2121
C				.6278
D				.2167
E				2.9309
				6.9744
				2.1161
	tandard Min./Job			21.9321

Work elements are listed in sequence, with set-up elements clearly labeled

Standard times are picked up from file data. Standard is total of element times

STANDARD IS SET for inspection operation by analyzing work elements and inserting appropriate time values on observation sheet (above). Time values come from file of standard data in time study office

Incentive Plan for Inspectors Increases Output 40 Per Cent

STANLEY SCHAEFFER • METHODS ENGINEER, THE DUMORE COMPANY, RACINE, WIS.

AN INCENTIVE PLAN has increased output of inspectors at Dumore by at least 40 per cent. At the same time, their take-home pay has gone up about 27 per cent. Also, we have been able to reduce man-hours of work in direct proportion to savings without sacrifice of quality and with less supervision.

The plan that produced these results has been in operation about a year and a half. It was adopted in preference to our former straight daywork system for inspectors for two reasons. First, the workers themselves wanted an incentive plan. They asked for the same opportunity as direct production workers to increase their earnings by increased output. Second, management felt it was desirable to increase the coverage of its incentive program as much as possible. Inspection operations, although difficult to put on incentive, were a

2 Standard Setup and Instruction Sheet

TOOLS AND GAGES USED	NAME OF PART	Bearing	PART NO.	R426-0083
1" Micrometer 2" Micrometer T80-5864 Plug gage High speed spindle tester. Sheffield shadow gage– T-80-7640 Master	OPERATION	Inspect DA-1	OPR. NO.	10
	MATERIAL	N.D. 7502-B-16	DEPT. NO.	10C
	MACHINE	Bench	MACH. NO.	

STANDARD
Per Job 21.93 Min.
Per Pc. 1.31 Min.

DESCRIPTION OF OPERATION	FEED	SPEED
(A) Select DA-1 sample and unwrap.		
(B) Test for drag-spin between thumb and finger. Visual inspect for: 1. Proper stamping. 2. Rust or defective finish. 3. One shield. 4. Retainers crimped properly.		
(C) Inspect width of both races in three places with micrometer.		
(D) Inspect I.D. with go–no go plug gage. Accept .0001" oversized but report to supervisor.		
(E) Inspect O.D. with Sheffield shadow gage. Wipe with cloth. Out of round limit .0006".		
(F) Test on high speed spindle for noise, roughness, wobble and retainer drag.		
Oil bearings (submerge).		
Rewrap in rolls of ten.		

Incentive standard is transferred from observation sheet to inform inspector

Description of operations guides the inspector and standardizes the method

INSTRUCTION SHEET for individual inspectors gives all facts needed to perform job, including tools and gages required, proper sequence of work, and final incentive standards, per job and per piece

logical target because they are so intimately related to production.

The Incentive Plan · The large number of individual parts and of different types of inspection required made the use of standard data the only practical approach to the problem. Data were based on actual time studies of a large number of all types of inspection operations. The studies were broken down into comparable elements and put in the form of tables or charts (Figure 3) to simplify finding basic work element times.

More than six months were needed to gather and compile all the required information.

The incentive phase of the installation is a standard-hour plan. Operators are guaranteed their base rates, which are the evaluated rates for the various jobs. And when working on incentive, inspectors are paid for all earned hours.

In developing the incentive plan, we found it was not practical in all cases to express standards in hours per hundred units. Minutes per piece were used instead for a number of operations, especially those involving sampling. This variation gives us a flexible standard which can be adjusted according to lot size and amount of inspection required for each piece.

Assume, for example, that the standard for a part requiring four dimensional inspections is 0.283 minutes per piece, and that rejections of the sample lot indicate that one dimension must be checked 100 per cent. Under these conditions, it is a simple matter to add the required time for the 100 per cent dimensional check to the balance of the lot and thus cover the entire job with a standard.

When we first introduced inspection incentives, we were somewhat doubtful as to the amount of time that might be consumed in making adjustments for variations in sampling. This turned out to be no problem in practice, since it takes less than 30 minutes of work a day by one timestudy clerk. Where standards are expressed in minutes per piece, the conversion to stand-

3 Standard Data Summary Sheet for Bearing Inspection

Times Include a 12.5% Delay, Personal and Material Handling Allowance

	STANDARD MINUTES PER PIECE		PER JOB
Prepare and Report Time:			8.8541
Unwrap Bearings-(1) Individual Boxes (w/waxed paper)	.1900		
(2) Roll (a) 10 in Waxed Paper	.0452	A	
(b) 5 in Waxed Paper	.0904		
Inspect I.D.-(1) 3 Step Plug (a) 1 Side Only:	.1407		.2167
(b) 1 Side & No.-Go Plug or- 2 Side & No-Go when nec.:	.2291		.2167
(2) No Go-Go plug (Go. 1 Side - No-Go, 2 Sides):	.1913	D	.2167
(3) Taper Gage (a) Alone: (b) With No-Go Plug if Nec.			
Inspect O.D.-(1) Micrometer:	.2040		.6278
(2) Shadowgraph (Sheffield) - Hand Wipe:	.2205		2.9309
(3) Shadowgraph (Sheffield) - Cloth Wipe:	.3000	E	2.9309
High Speed Spindle Test	.3151	F	6.9744
Oil Bearings - (1) Submerge in Oil:	.0663	G	2.1161
(2) Oil O.D. in Hand (a) Incl. Aside:	.0594		
(b) No. Aside:	.0422		
Wrap Bearings - (1) Individual Boxes (a) No Mark:	.4317		
(b) Mark O.D. or I.D.:	.5276		1.1998
(c) Mark O.D. and I.D.:	.5558		1.1998
(2) Waxed Envelopes (a) No Mark:	.5289		.3510
(b) Mark O.D. or I.D.:	.6324		1.5508
(c) Mark O.D. and I.D.:	.6886		1.5508
(3) Coin Envelopes (a) No Mark:	.5949		
(b) Mark O.D. or I.D.:	.6908		1.1998
(c) Mark O.D. and I.D.:	.7190		1.1998
(4) Roll in Paper (a) Roll of 10:	.0636	H	
(b) Roll of 5:	.1272		
Inspect for Eccentricity and Radial Looseness - Fixture:	.4661		4.4696
Inspect Width-(1) 2 Races, Same Width:	.1969	C	.6278
(2) 2 Races, Different Width:	.2940		.6278
(3) 2 Races, Different Width and Parallelity:	.3938		.6278
Finger Drag Test-(1) Spin, Thrust 1 Side:	.1325	B	.2121
(2) Spin, Thrust 2 Sides:	.1612		.2121
(3) No spin, Thrust 2 Sides:	.1207		.2121
(4) Spin on Armature, No Thrust:	.2008		.2121
Wash Bearings-(1) By Hand in Booth:	.6078		5.1788
(2) In Machine:	.9525		9.7460
Screen Test for Drag with Armature:			
.0071 Total with Handling - Rolls of 10:	.2709/Pc.		
- Individually Wrapped:	.8225/Pc.		

BASIS FOR STANDARDS is file of summary sheets like one above which shows elements used in time study reproduced on preceding page (Figure 1). Engineers spent over six months building up file

ard hours is made by the payroll department.

How a Standard Is Set · The first step in setting a standard is to list each element on a time study form (Figure 1) and take the appropriate times from standard data summary sheets (Figure 3.) Separate setup times are provided to cover time for getting and returning blueprints, instruction sheets, tools, and sample pieces; filling out reports and time cards; and performing other get-ready or clean-up work related to the job. These setup times, of course, are one-time or "per job" figures which do not vary with size of lot or length of run.

Next, individual instruction sheets are filled out, similar to the production operator's process card. This standardizes the method and guides the inspector. Instruction sheets are prepared by the methods department in cooperation with the inspection foreman. They are also subject to final approval by the chief inspector.

Standards set as outlined above have numerous advantages. To us at Dumore, the three most important have been:

1. We now have accurate inspection cost figures.

2. We have been able to standardize and maintain better control over our inspection methods.

3. Our inspectors turn out more work of higher quality than before.

PIPE DEPT. ELMER KESTNER FOREMAN DATE 6-3-49	DIRTY FLOOR	REPAIRS	DIRTY EQ.	BLOCK AISLE
OIL FILLER				
FLANGE	3			
2" EXHAUST				
CROSS TUBE				
TRACTOR ASSEMBLY				
"Y" PIPE & ASSEMBLY				
TRACTOR PIPE				
CUT-OFF SAWS				
GAS WELDERS				
CONT. WELDERS				
NIP. & SLEEVE	3		1	2
CHEV. PIPE & ASSEMBLY				

MUFFLER DEPT. JOHN FAHAY FOREMAN DATE 6-3-49	DIRTY FLOOR	REPAIRS	DIRTY EQ.	BLOCK AISLE
CHEV. ELLIP.				
BA MUFFLER	2	3		1
CHEV. UNIT				
5" CHEV. TRK				
FORD TRACTOR				
6" ROUND				
5" ST. THRU.				

MATERIAL, SHIPPING AND SUPPLY F. CHURCHMAN, FOREMAN DATE 6-3-49	DIRTY FLOOR	DISORDER	BLOCK AISLE
STEEL			
SHIPPING	1		

TOOLS AND MAINTENANCE WM. DOLLENS, FOREMAN DATE 6-3-49	DIRTY FLOOR	DIRTY EQ.	BLOCK AISLE
TOOLROOM		1	
MAINTENANCE			

PARTS DEPT. GAY EASTON, FOREMAN DATE 6-3-49		DIRTY FLOOR	DIRTY EQ.	BLOCK AISLE
			1	

FOURTH COPY of daily report is torn along perforations and parts are distributed to foremen of departments involved. Numbers indicate the number of days the condition has continued without correction

Daily Report Improves Housekeeping

CLEANLINESS is no longer a problem at the Seymour North plant of Noblitt-Sparks Industries, Seymour, Ind. Every day the plant's foremen get a slip noting any housekeeping deficiencies in their departments. The form is extremely simple but has proved very effective in operation.

Filled out by the foreman of inspection, the Daily Housekeeping Report contains a box for each department. In the boxes are listed the various sections of the department, with spaces opposite each for numbering. A number in any one of these spaces represents a particular condition of undesirable housekeeping and indicates the number of consecutive days during which that condition has existed. When inspection reveals no uncleanliness, or when a bad situation has been remedied, the space is left blank.

The form is made up in four copies each day. One goes to the production superintendent, one to the personnel manager, and one is filed in the inspection department. The fourth copy of the report is cut up (see accompanying illustration), and each departmental foreman gets his appropriate section.

OUTSIDE ROTARY BINS are filled from inside the stockroom enclosure with small, fast-moving, inexpensive items. Craftsmen standing on the outside can select at will whatever parts they need for a particular job

Self-Service Rotary Bins Cut Maintenance Stockroom Costs

No waiting by maintenance craftsman at the stockroom window for small, commonly used items. He helps himself from free stock bins

E. E. BARNES • SUPERINTENDENT OF MAINTENANCE, SEATTLE DIVISION, BOEING AIRPLANE COMPANY

USE OF ROTATING, "self-service" storage bins for disbursement of small, fast-moving maintenance supplies has reduced direct and indirect maintenance costs at Boeing.

Real savings are noted in materials handling costs and in keeping down the waiting time of craftsmen at the stockroom counters.

This is not to say there is no control over maintenance supplies, but that control is exercised only to the degree it is necessary. A regular system of control is operating over the normal flow of stock items, which run, as to type and sizes, into five figures. This system involves the conventional stockroom routine of purchase requisition, bin control

INSIDE ROTARY BINS hold small parts that are more valuable. Storekeepers disburse these parts "free" within fixed quantity limits

card, stock record card, receiving report, and disbursement sheet.

Of these only the use of the disbursement sheet directly affects the craftsmen. Even this sheet has been designed to minimize their waiting time. It replaces the customary craftsman's materials requisition and is made out by the stockroom clerk whenever withdrawals are made. It lists quantity, item, unit cost, and job number, and requires only the signature of the craftsman receiving materials. No immediate supervisory approval is needed. At the close of each day all disbursement sheets are forwarded to the office of the maintenance superintendent for posting to individual job orders and for review by maintenance foremen for the possibility of unauthorized usage. The sheets finally go to the accounting department for cost accumulation.

There are about 800 maintenance craftsmen at Boeing, representing less than 4 per cent of its normal total employment. These craftsmen secure most of their maintenance supplies from the main stockroom, although special kinds of supplies can also be withdrawn at two subsidiary stockrooms and at maintenance cribs strategically spotted over the large plant—some 4½ million square feet of floor space. Also, janitor supplies are kept in factory service cabinets around the plant to eliminate time wasted by an employee traveling to the main supply center.

The main stockroom, including the office, occupies an area of 12,000 square feet. These areas are divided by a firewall, and the storage area is subdivided into five sections, as follows: automotive and paint; plumbing and hardware; electrical; machine and small tool repairs; and bulk storage.

All items are stored in open-front bins, and large pieces are kept on the floor. Bin sections are lettered, and bins and drawers are numbered. Storage above the bins or on platforms is permitted for reserve quantities or bulky items.

Operation of the maintenance stockroom requires a personnel of 28 people, as follows: 1 assistant foreman, 5 record clerks, 15 storekeepers on the first shift, 5 on second shift, and 2 on third shift. The record clerks check bin cars, write up purchase requisitions, check receiving data and record them on stock cards, and check and price disbursement sheets. The storekeepers receive and disburse the stock at counters and maintain stock minimums. The employees on second and third shifts disburse material and keep the stockrooms in an orderly condition.

Many "Free" Items

Were it not for the use of rotary bins to disburse many small utility items on a "free stock" basis, the personnel requirements would be greater. However, as many of the small items as practical are charged off to "free stock" and kept in these bins for use as needed. These include items such as nuts, bolts, washers, tampins, screws, small fittings, conduit clamps, and so on. These rotary bins are fed by storekeepers inside the stockroom enclosures, and are accessible to craftsmen outside the enclosures.

In addition, a great number of items are stored in similar rotary bins maintained within the stockroom enclosures on the same basis, and are disbursed by storekeepers without being recorded on the disbursement sheet. On some items of small value no record is kept on the disbursement sheet up to quantities of six, others twelve, etc.

Experience with this method has shown no noticeable difference in quantity used before and after the inception of this practice. Also, no injustice is done to proper accounting of maintenance costs because on small jobs the quantities picked up constitute a negligible factor, and on large jobs involving a bill of materials the "free" withdrawals can be closely estimated and charged to the job.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

"Gon Tippers" Reduce Handling Costs

Materials handling cost has been reduced and work made easier at Saginaw Steering Gear Division, GMC, Saginaw, Mich., through the use of specially designed hoppers known as "gon tippers."

The old way of supplying individual production work stations was to transfer the parts individually from gondolas to tote pans or to make the operator reach over the sides of the gondola to secure parts.

Fork trucks now can pick up a full gondola-load and move it directly to the production operation. The gondola is placed in the hopper and tilted, giving the operator easy access to a large supply of parts, conveniently placed.

The results: (1) handling costs are substantially lowered; (2) production is increased because there is no downtime waiting for parts; (3) operator fatigue is minimized because the operator no longer has to reach out of the normal working area to obtain parts.

Palletizing Storage Boxes Cuts Handling Costs

Palletized and tiered storage boxes in the Ford Motor Company plant, Detroit, Mich., are saving 75 per cent of the floor area previously used. The area saved is now being used for expansion of production facilities without the need for new building construction.

The number of parts stored per square foot has been increased by tiering boxes four high; previously, no vertical storage was possible.

Material handling costs are lower, too. Ford trucks have replaced the old push-and-pull hand trucks and can move the materials into the storage area and out to production lines quicker.

Here are the results—75 per cent saved in floor area; production expanded without costly building construction; thousands of dollars saved; materials handling costs lowered; and work made easier.

Venetian Blind Cleaner Halves Washing Time

One man keeps 750 venetian blinds clean at Republic Aviation Corporation's plant in Farmingdale, N. Y. The device that helps him turn the trick is a sheet metal trough filled with soapy water that is agitated by compressed air.

The trough is 14 feet long, 24 inches wide, and 30 inches deep. The bottom is round, and the sides and ends are vertical. Running the full length of the bottom is a 1¼-in. compressed air pipe, with regulating valve, perforated with ¼-in. holes on 12-in. centers. The trough is mounted so that its top is 42 inches high, providing a comfortable working position.

When in use, the trough is filled to about 12 inches with water, and mild soap is added. The air line provides sufficient agitation to do a thorough cleansing job.

The blind is hung with its end in the soapy water. As the employee washes the slats, tapes, and cords he gradually brings the entire blind down through the trough. After cleaning, the blind is hung on a rinsing rack and sprayed with a hose.

Before this device was put in

operation, a man could do about 11 blinds per day, excluding tapes and cords. Now that figure has been doubled, and tapes and cords get washed too.

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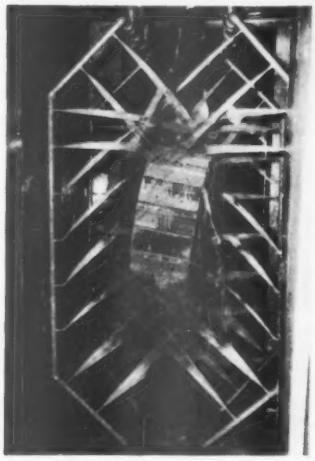


Heavy Parts Are Automatically Painted

Automatic painting has completely eliminated hand spraying of heavy parts at Allis-Chalmers Manufacturing Company, Springfield, Ill. Heavy parts are hung on the overhead monorail conveyor and pass automatically to a washing and rinsing machine, then to the flow-coat painting booth and to the drying oven.

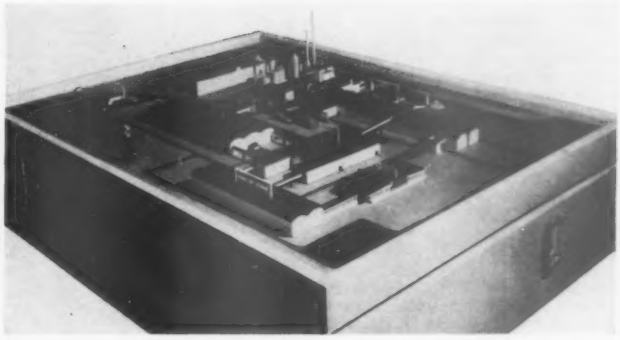
The paint is reclaimed and reused. Paint cost is down better than 30 per cent, spraying time has been completely eliminated, quality improved, and unit costs reduced.

•

Annual Report to Workers Features Jigsaw Puzzle

A jigsaw cutout shows employees of American Type Founders, Inc., Elizabeth, N. J., the breakdown of the corporation's 1948-49 income dollar. Surrounding the "pie" diagram of this dollar are views of products made by the company and its subsidiaries. The puzzle accompanied the company's easy-to-read financial report to employees at the end of the fiscal year, March 31.

The printed report, with cartoons, pictures, and the jigsaw insert, follows the ATF policy of making annual statements attractive. Last year's report contained a popup and phonograph record (FACTORY, June, 1948).



Plant Visitors Get Bird's-Eye View

A model of the Springfield, Ore., mill of Weyerhaeuser Timber Company gives visitors a bird's-eye view of the entire plant and grounds and a better understanding of the operating problem.

Wooden model buildings are equipped with transparent, plastic signs which can be lit up individually by small lamps in the base. A group switch panel controls the lights. Ground areas are given a texture coat sprayed with earth-red colors. Water surfaces are finished to create an illusion of depth. Miniature steamships are at loading docks, and tiny logs lie in ponds and on log hauls.

Constructed on a scale of one inch to about 75 feet, the model is contained in a carrying case which has folding legs for display purposes. The whole unit weighs approximately 70 pounds.

FLASH CAMERAS HELP SAFETY MEN record good or bad safety conditions at the Firestone Tire & Rubber Company, Akron, O. Pictures and comments are posted on bulletin boards and shown at monthly safety meetings. The projector can be used to show opaque pictures and eliminates the need for costly slides.

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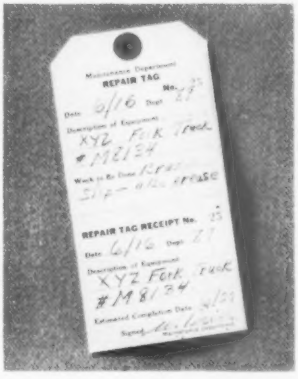

Maintenance Repair Tags Identify Equipment

A two-part maintenance department repair tag has helped to identify departmental ownership of equipment returned for repairs to the maintenance servicing department at Wagner Electric Corporation, St. Louis. It also tells the operating department when to expect return of the completed job. Further, equipment no longer is lost or gets returned to the wrong department, and the cost of repair is properly charged.

Before, due to the high volume of miscellaneous operating equipment delivered to the maintenance and machinery repair department for quick repair, it was extremely difficult to identify ownership and to schedule the equipment properly for repair. This new repair tag has eliminated all such confusion and has resulted in better work and proper scheduling of repairs.

As an example, let's assume a truck in department 7 requires repairs. The foreman of this department fills in both sections of the repair tag and attaches it securely to the truck. The truck is delivered to the maintenance department by an employee of department 7. The storeroom group leader receives the truck, signs the receipt stub and returns it to the employee, who returns the stub to the foreman of the department. The first portion of the tag remains attached to the truck until the repair work is completed, after which the truck is returned to department 7.

Repair work is handled in the

order of its delivery to the maintenance department, as denoted by the tag numbers, which are assigned consecutively. No repairs are accepted by the maintenance department without tagging.

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Foolproof Control for Overhead Cranes

DANIEL H. SPOFFORD, assistant factory manager, The Wiremold Company, Hartford, Conn.

A 4- or 5-ton overhead crane usually has six control buttons, all plainly marked. When the operator faces in one direction, in order to move the trolley to the right, he presses the button marked "Trolley Right." In this case the markings are perfectly clear. When he faces in the other direction, however, in order to move the trolley to his right, he must push the button marked "Trolley Left." The same is true of the "Bridge Forward" and "Bridge Reverse" buttons. The operator must keep in mind his own position to know whether to push the "Forward" or "Reverse" button to move the bridge away from him.

This condition does not give the operator positive control over the crane. As a result, windows get smashed, steel is damaged, and other employees are in danger of getting hurt.

To overcome this situation, we have painted arrows as well as directions on the bridge, the switch box, and the pulley. The operator now sees on the bridge the legend "Bridge Right" and an arrow showing the direction in which the bridge will move when the "Bridge Right" button is pushed. It is no longer necessary for him first to consider whether "Right" means right or left, in reference to his own position.

•

Checklist Aids Correction of Safety Hazards

Uncovering dangerous conditions and unsafe practices that might otherwise be overlooked is the job of a daily departmental safety checklist. Put into use at the Ceco Steel Products Corporation, Chicago, the form has reduced the annual accident frequency to between 8 and 10. Attractive cartoons and jingles on the form illustrate the dangers to employees of careless housekeeping.

The checklist acts as an effective safety stimulus on foremen and superintendents. Periodic spot-checks in all 14 departments prevent them from becoming lax and failing to turn in the report.

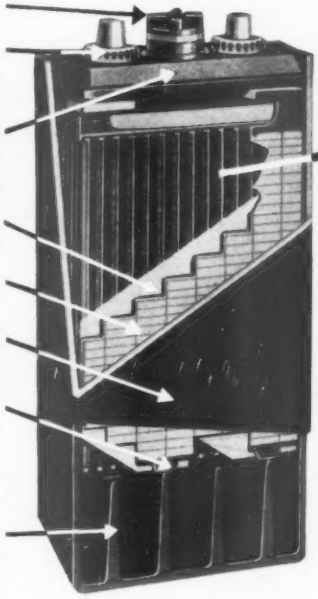
DOUBLE THE VOLUME OF MATERIAL is handled with the same labor force by using a 3000-lb. fork lift truck to carry and tier raw materials in the receiving warehouse of Sangamo Electric Company, Springfield, Ill. The old way was to handle the materials in 500-lb. unit loads with hand trucks. No tiering was possible. The truck handles 2500-lb. unit loads, and the materials are stacked four tiers high, resulting in saving in storage space

THOUGHT PROVOKERS! That's what management is calling the new suggestion boards at Allison Division, General Motors Corporation, Indianapolis. Employee suggestions are up better than 50 per cent since the installation of these boards throughout the plant. Two slogans are promoted on the board: "Ideas Are Easy," and "Think." Photographs showing typical employee suggestions are posted on the boards, and changed from time to time. The boards are well lighted from the rear so that they stand out, no matter where they are located in the plant

EXIDE-IRONCLAD BATTERIES ARE DIFFERENT!

They are specially designed to provide years of dependable service in all MOTIVE POWER WORK

Storage batteries are called upon to perform many tasks. No single type of battery is adequately suited to all. To meet these numerous requirements, Exide engineers have developed special types, to fit each application.* Among these several types is the specially designed Exide-Ironclad Battery. Details shown below.


VENT PLUG specially designed to prevent escape of electrolyte.
GREASE SEAL RING NUT holds battery elements securely in place . . . prevents creepage of electrolyte . . . keeps tops clean and dry.
SEALED CELL COVER flush with top of jar. Prevents collection of dirt or moisture . . . keeps impurities out of cell . . . eliminates leakage of electrolyte.
SEPARATOR of high porosity, specially treated to last the life of the battery.
NEGATIVE PLATE made extra heavy and built to match the long life of the positive plate.
JAR made of specially tough and durable Giant Compound. Built to withstand the jolts and jars of hard industrial usage.
FEET. Internal short circuits practically eliminated because the two feet on negative plate rest on different ribs from those of the positive plate, and because separators extend below both plates and rest on all four ribs.
RIBS support all plates and separators. Their height provides generous sediment space so that internal cleaning is unnecessary.

DIFFERENT IN DESIGN
DIFFERENT IN CONSTRUCTION
DIFFERENT IN SERVICE QUALITIES

Chief among these differences is the unique positive plate, an exclusive Exide feature.

EXIDE-IRONCLAD POSITIVE PLATE

Consists of a series of finely-slotted tubes which contain the active material. So small are these slots that, while permitting easy access of electrolyte, they retard the active material from readily washing out or jarring loose . . . adding considerably to life of plate.

Exide-Ironclad Batteries have ALL FOUR of the characteristics that a storage battery must have to assure maximum performance from battery electric industrial trucks — high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of dependable day-in, day-out service.

"Exide" and "Exide-Ironclad" *Reg. Trade-marks U. S. Pat. Off.*

*

DESIGNED FOR STATIONARY USE

The Exide-Manchex Battery has the manchester type positive plate with the lead button construction. Specially designed for stationary use in many classes of industry.

DESIGNED FOR AUTOMOBILE USE

The Exide Automobile Battery has plates of staggered grid construction. Specially designed for use in automobiles, trucks, buses, aircraft and numerous other applications.

1888 . . . DEPENDABLE BATTERIES FOR 61 YEARS . . . 1949

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

maintenance data sheet 167

Standard Times for Janitors

IN THE TABLES below and on page 150 are given detailed standard times for janitorial work in an industrial plant. They were developed by the Lockheed Aircraft Corporation at Burbank, Calif., to measure work efficiency and to establish janitorial personnel requirements. These data are sufficiently complete to permit establishing an accurate time standard for complex janitorial activities in any given area by adding together the standard data times for all of the job elements involved in keeping that area clean. Last month, FACTORY's Maintenance Data Sheets, Numbers 165 and 166, listed Lockheed's standard times for general cleaning operations, such as mopping, waxing, dusting, vacuuming and washing.

FACTORY AREA MANUAL SWEEPING—WOODEN FLOORS (Base Allowance in Minutes)

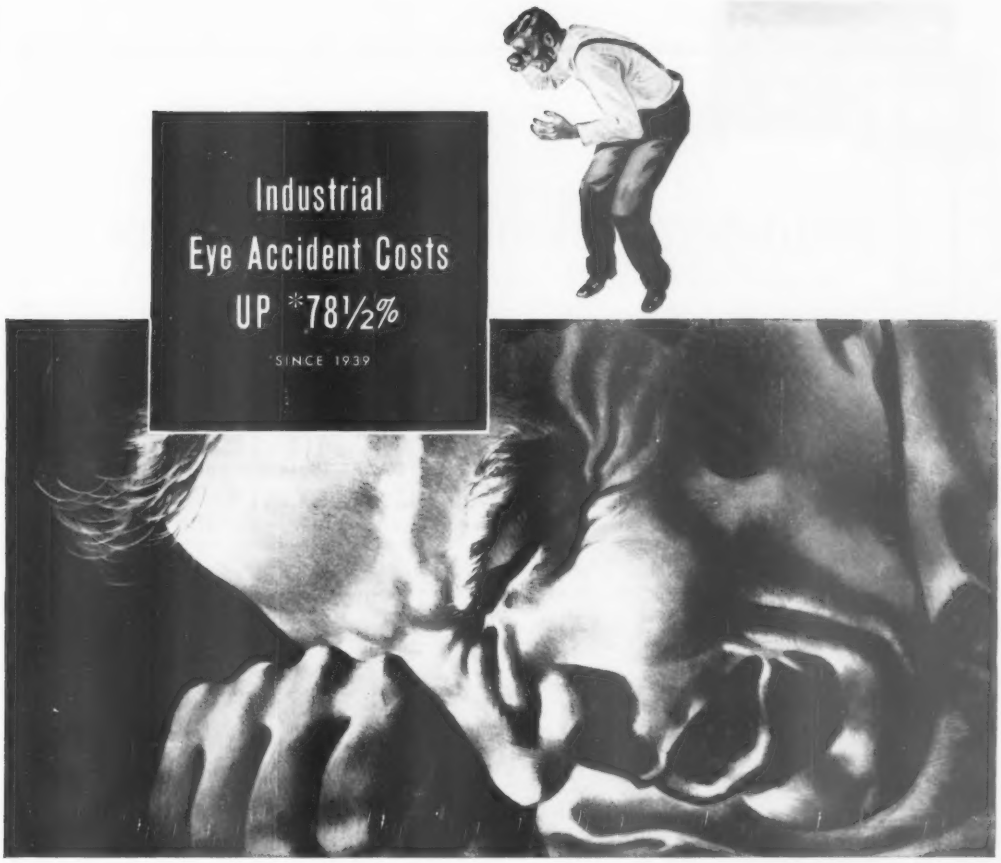
Combination Trash and Density Conditions (see code below)

CODE { 1st letter (L, M, or H) covers light, medium, or heavy degree of trash accumulations
2nd letter (L, M, or H) covers light, medium, or heavy density of floor installations

Floor Area in sq. ft.	LL	LM	LH	ML	MM	MH	HL	HM	HH
500	10	11	12	12	13	14	14	15	16
1000	20	21	23	24	26	27	28	30	31
1500	30	32	35	36	39	41	42	45	47
2000	40	42	46	48	52	54	56	60	62
2500	50	53	58	60	65	68	70	75	78
3000	60	63	69	72	78	81	84	90	93
3500	70	74	81	84	91	95	98	105	109
4000	80	84	92	96	104	108	112	120	124
4500	90	95	104	108	117	122	126	135	140
5000	100	105	115	120	130	135	140	150	155
5500	110	116	127	132	143	149	154	165	171
6000	120	126	138	144	156	162	168	180	186
6500	130	137	150	156	169	176	182	195	202
7000	140	147	161	168	182	189	196	210	217
7500	150	158	173	180	195	203	210	225	233
8000	160	168	184	192	208	216	224	240	248
8500	170	179	196	204	221	230	238	255	264
9000	180	189	207	216	234	243	252	270	279
9500	190	200	219	228	247	257	266	285	295
10000	200	210	230	240	260	270	280	300	310

Continued on page 150

Prepared by E. H. Farmer, Plant Engineer, Lockheed Aircraft Corporation, Burbank, Calif.



Here's One High Cost that's "Asking For" DRASTIC ACTION on Your Part!

WHEN critically examining your costs of doing business and seeking more profitable operation, remember that NO ONE HAS A VESTED INTEREST IN HIGH EYE ACCIDENT COSTS! These costs can be cut *drastically* now.

98% of all industrial eye injuries can be prevented when shop workers wear safety goggles, according to the Society for the Prevention of Blindness. Individual case histories show that American Optical Company eye protection programs have saved sums like these: (1) $16,607 in eight years (2) $14,000 in two years (3) $44,200 annually.

Your nearest AO Safety Products Representative will be glad to explain the AO program, which may produce similar savings for *you*. Ask him for complete details.

American Optical Company
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

maintenance data sheet 168

Standard Times for Janitors

Continued from page 148

FACTORY AREA MANUAL SWEEPING—CONCRETE FLOORS (Base Allowance in Minutes)

Combination Trash and Density Conditions (see code below)

CODE { 1st letter (L, M, or H) covers light, medium, or heavy degree of trash accumulations
2nd letter (L, M, or H) covers light, medium, or heavy density of floor installations

Floor Area in sq. ft.	LL	LM	LH	ML	MM	MH	HL	HM	HH
500	11	12	14	15	16	17	18	19	20
1000	22	24	27	29	31	33	36	38	40
1500	33	36	41	44	47	50	54	57	60
2000	44	48	54	58	62	66	72	76	80
2500	55	60	68	73	78	83	90	95	100
3000	66	72	81	87	93	99	108	114	120
3500	77	84	95	102	109	116	126	133	140
4000	88	96	108	116	124	132	144	152	160
4500	99	108	122	131	140	149	162	171	180
5000	110	120	135	145	155	165	180	190	200
5500	121	132	149	160	171	182	198	209	220
6000	132	144	162	174	186	198	216	228	240
6500	143	156	176	189	202	215	234	247	260
7000	154	168	189	203	217	231	252	266	280
7500	165	180	203	218	233	248	270	285	300
8000	176	192	216	232	248	264	288	304	320
8500	187	204	230	247	264	281	306	323	340
9000	198	216	243	261	279	297	324	342	360
9500	209	228	257	276	295	314	342	361	380
10000	220	240	270	290	310	330	360	380	400

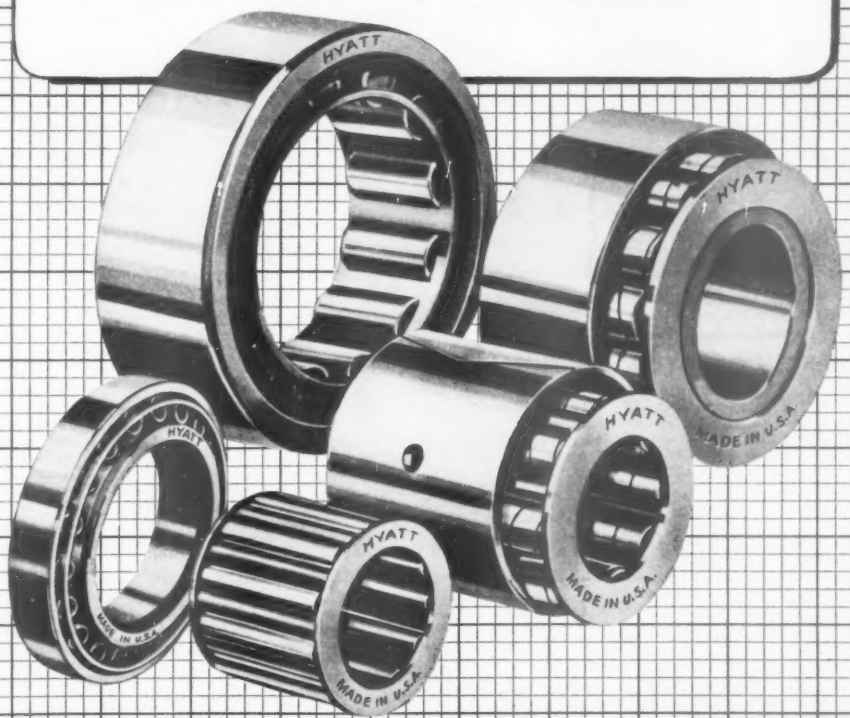
Prepared by E. H. Farmer, Plant Engineer, Lockheed Aircraft Corporation, Burbank, Calif.

The Line to Look to... HYATTS

Design engineers, for more than half a century, have learned to look to Hyatt for that better grade of roller bearings which adds to the operating efficiency of machines and equipment in almost every field.

We are probably making just the type, size and width Hyatt Roller Bearing you need for that new job you are designing—or for modernizing your present product.

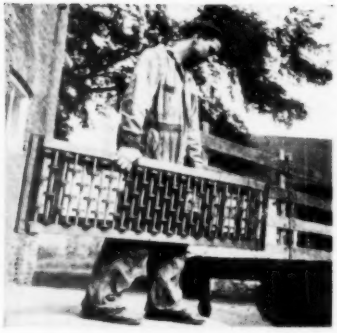
To help you locate the right roller bearing to fit your job precisely we will gladly send you catalogs or if you wish to consult a member of the Hyatt Engineering Service staff—just write to Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



HYATT ROLLER BEARINGS

WHAT'S NEW IN EQUIPMENT

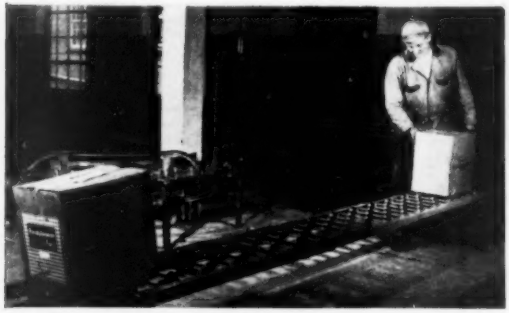
BRIEFED HERE—FOR THE CONVENIENCE OF



1 COLLAPSED CONVEYOR SECTION is light enough to be carried to the job, then . . .

2 EXTENDS to bridge space between loading dock and truck, where it . . .

3 FACILITATES SMOOTH FLOW of crated or packaged material, or other bulky materials. It also . . .



4 JOINS SECTIONS of stationary conveyor across aisles or other traffic areas, as it . . .

5 TELESCOPES into itself to allow passage of service lines or hand trucks carrying supplies

TELESCOPIC CONVEYOR SECTION SPEEDS MATERIALS HANDLING

This conveyor section, over 10 feet long, can be collapsed to only 54 inches. It is light enough to be carried easily by one man, but made of reinforced 16-gage steel for strength. The maker says it will hold up to 75 pounds per square foot.

Where space is limited, or where a conveyor line must pass through a traffic area, the section may be set up to join parts of the permanent installation. It is easily retractable to allow passage of trucks or service lines.

When used in loading a truck from a dock or directly from the assembly line, the unit may be extended full length to reach deep into the body of the truck. As the truck fills up, the conveyor may be gradually telescoped back into itself without affecting the flow of the product.

The section is made with heavy-duty, $2\frac{1}{8}$-in. skate wheels or with $1\frac{1}{2}$-in. ball-bearing aluminum rollers. The skate-wheel type has a riding surface of 12 inches, the roller type, 15 inches. Yokes or legs of various types are available for setting up the section where most useful.

Maguire Machinery Co., Inc., 1000 N. Division St., Peekskill, N.Y.

Electronic Motor Control

Intended for remote stepless speed adjustment and control of fractional-hp. motors, Dyna-Speed electronic motor control unit consists of a rectifier cabinet, d.c. ball-bearing motor, remote control dial box, and 10 feet of connecting cable.

Speed control dial knob may be set to any speed within a range greater than 20 and 1 (80-1800 rpm.). Maker claims that this can be maintained substantially constant regardless of load changes, and that constant torque can be maintained over the entire speed range. Available in ratings of $\frac{1}{4}$ and $\frac{1}{2}$ horsepower.

The Brown-Brockmeyer Co., Dayton 1, Ohio.

•

Electro-Plating Rectifier

Selenium rectifier, Model EPF 4304, is intended for use in electroplating, has 2000/1000-amp., 6/12-v. range. Unit is force-cooled by 16-in. fan blades, has 3-pole contactor with overload protection. Air intakes are equipped with filters. Stack has 26-v. plates with double-center contact for equalized current distribution. Unit weighs 1000 pounds, measures 63x32x21 inches, is housed in heavy-gage steel.

The Electric Products Co., 1725 Clarkstone Rd., Cleveland 12.

Storage Bins

Line of 78-in. bins is for flat storage, tools, small parts and display of small or packaged items. All units are 3x1x6½ feet. Dividers are adjustable horizontally in inches. Shelves are movable up and down in 1½-in. steps, and are reversible.

Lyon Metal Products, Inc., Aurora, Ill.

•

Stacking Box

In sizes ranging from 10x16x6 to 10x20x8 inches, stacking box is made of 16- and 18-gage steel. Features include reinforced corners, spot-welded construction, drop handle at each end, and continuous rim.

Bay, Inc., 3001 N. 16th St., Philadelphia 32.

•

Diaphragm Relief Valve

Series 62-A diaphragm relief valve is designed for use in lines carrying air, cold water, oil, insecticides, and similar liquids at pressures up to 250 psi. Operation is automatic, and said to provide high relief without blow-down. When pressure exceeds the relief setting, diaphragm and valve seat are raised, opening the valve, and releasing air or liquid through the outlet port.

All parts in contact with air or fluid being handled are brass. Synthetic rubber diaphragm, reinforced with nylon cloth, is oil resistant. Valves range from ⅛- to 1-in. pipe sizes.

C. A. Norgren Co., 222 Santa Fe Drive, Denver 9.

•

Carbon Seal for Corrosive Chemicals

Self-lubricating mechanical seal is said to be capable of withstanding corrosive chemicals. It is intended for use with highly volatile fluids under high pressures, in continuous service, and at high shaft speeds. Manufacturer states that seals are free from warping and gumming, and are adaptable for installation in hard-to-reach locations where servicing would be difficult or would require down-time of equipment. They may be used in pumps, agitators, mixers, and similar equipment handling corrosive substances.

Morganite, Inc., 3302 48th Ave., Long Island City, N. Y.

IN THIS ISSUE

Smoke Detector indicates fires at remote locations, protects as many as 4 spaces at once Page 210

Screw Grab with floating heads for varying sizes handles three bales of pulp material at once Page 303

Line Purifier removes oil, water, scale, sediment from compressed air and steam lines Page 208

Emergency Valves close steam or fuel lines, flood critical areas, when fires occur Page 204

Compressible Lubricant expands as pressure drops, to fill voids; cuts down servicing costs Page 156

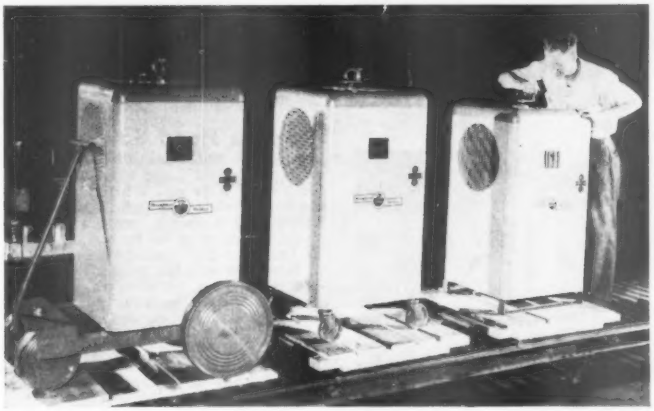
Electric Motors have built-in hydraulic coupling that protects equipment from shock and "jamming" Page 174

Protective Floor Coating goes on over old asphalt or concrete surfaces, dries in 36 hours Page 204

Electrical Differential Speed Drive regulates tension between machine and winding reel Page 260

Frost Eliminator keeps refrigeration coils, cold storage spaces, free from condensed moisture Page 303

A. C. Motor Starter is sealed in oil, may be used in corrosive or combustible atmospheres Page 303



TRANSFORMER-TYPE D.C. WELDER

Transformer-type d.c. welders operate on 220 or 440 volts a.c. Major components include 3-phase transformer, adjustable reactor, plate-type full-wave selenium rectifier.

Efficiency at rated load is said to be 66 per cent, 73 per cent at 20 per cent rated load. No-load loss of 300-amp. unit is 500 watts. Time of recovery from rated load to short circuit or vice versa is claimed to be 0.007 seconds. Power factor under normal load conditions is comparable to that of induction-motor-driven welders. Open-circuit voltage is 70 volts at all current settings. On the 300-amp. unit, current adjustment ranges from 30 amperes at 20 volts to 400 amperes at 40 volts.

Available in 200-, 300-, and 400-amp. ratings. Welders are equipped with skids, 5-in. swivel-mounted wheels, or heavy-duty running gear to suit requirements.

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30.

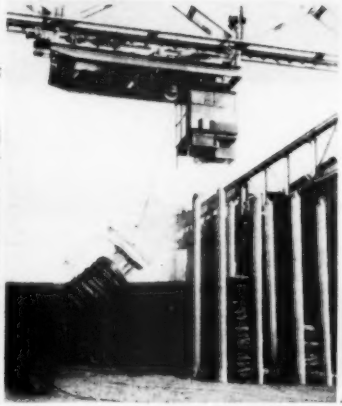
Air Guns

Line of air guns has been designed with a suspension hook so placed that operator may hang up the gun by sense of touch, not diverting his eyes from the work, claims the maker. Pistol-grip handles are styled to fit the hand, and each handle contains a strainer to prevent nozzle clogging.

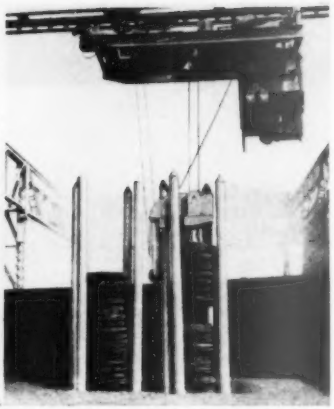
Type DA has valve in normal trigger position; the trigger in DB is located above the handle, operated by thumb pressure. Both types have standard male thread ¼-in. pipe connections. Type DC, for use where a constant flow of air is needed, has no trigger, but is equipped with a needle valve with which to adjust the volume of air.

Interchangeable nozzles include types delivering a concentrated conical blast for localized pin-pointing of air, a 45-deg. up blast, a flat air spray, a fan blast, and an adjustable air stream. 3-in. and 6-in. extensions

1 HAIRPIN HOOK slips into coils, picks them up. Then . . .



2 SPREADER PLATE expands to hold load firmly on the hook as . . .



3 CARRIER lifts, swings, stacks load on floor posts to save storage space

HAIRPIN HOOK AND CARRIER FOR COILED ROD AND WIRE

Stacking coils of rod or wire with hairpin hook and carrier saves storage space. The hook handles as many as ten 330-lb. coils at a time. It will pick them up from horizontal position or from vertical piles, stack them on floor posts, or carry them to the most convenient spot for use on the job.

Hydraulic action of the grab mechanism expands a spreader plate to hold load firmly. Both carrier and hook are controlled from cab. Thus different kinds of rod and wire can be separated, stored by sizes and alloys, and operator can keep accurate inventory record of withdrawals and replacement of stock.

Cleveland Tramrail Div., Cleveland Crane & Engineering Co., Wickliffe, O.

---

are also available for hard-to-reach places.

Paasche Airbrush Co., Dept. 8, 1909 Diversey Pkwy, Chicago 14.

•

Metal Shear

Featuring a self-centering vise adaptable to varying contours and shapes, "Swing-Cut" abrasive metal cut-off machine cuts up to 3-in. solids and 4-in. pipe, in both ferrous and nonferrous materials.

A 5-hp. geared-in-head motor eliminates belt drives. Vise is mounted on an adjustable swivel plate, calibrated in degrees, to provide for change from straight or 90-deg. cutting to any desired angle.

Stone Machinery Co., Inc., 302 Fayette St., Manlius, N. Y.

•

Insulating Tape

Known as Types R-12 and R-20 Silastic, tape consists of Fiberglas cloth impregnated and coated on both sides with rubberlike dielectric said to withstand temperatures above those that cause decomposition in ordinary rubber and resinous insulations. According to manufacturer, tape vulcanizes in 15 minutes at 260 degrees F. or in 3 to 5 minutes in steam autoclave at 50 psi. steam pressure. Available in $\frac{1}{2}$-, $\frac{3}{4}$-, 1-, $1\frac{1}{2}$-, and 2-in. widths.

Irvington Varnish & Insulator Co., Irvington 11, N. J.

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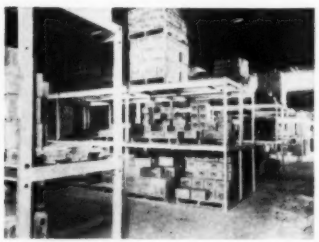
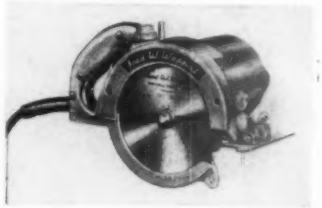


Pallet Rack

Prefabricated pallet rack is constructed of structural channel in two parts, an upright member, which can serve at either end or between sections, and the bed member. Beds are constructed with two channel cross members. All joints are welded. Holes are positioned in the uprights to meet specifications for pallet underclearance, and dimensions and capacities can be varied according to pallet sizes and load requirements.

Equipment Mfg., Inc., 21550 Hoover Rd., Detroit 5, Mich.



Electric Hand Saw

Called the Maxaw, 6-in. lightweight electric hand saw has a $6\frac{3}{8}$-in. blade. It cuts to a full 2-in. depth on square cuts, and cuts 2-in. dressed lumber at a 45-deg. angle. Trigger-type switch may be locked on. Tool is balanced for 1-hand operation.

Saw may be used for making jack-rafter cuts on light building jobs, or, fitted with suitable blades, for cutting masonry and other hard materials. Built-in depth adjustment ranges from 3/16 to 2 inches. Bevel adjustment is from 0 to 45 degrees. Tool weighs 10 pounds, has a telescoping guard, rigid rip fence.

Fred W. Wappat, Inc., Mayville, N. Y.

•

Hot Plate

For evaporation, boiling, and general heating, hot plate has temperature range from 140 to 850 degrees F. Automatic input control is said to maintain desired working temperature to close limits. Body is stainless steel; top plate, cast aluminum. Heating elements are nickel-chromium alloy. Two sizes are 12x12 inches and 12x24 inches, and sepa-

EXPEDITER EXTRAORDINARY!

TelAutograph Telescribers Send Handwritten Messages Via Wire Instantly to one or More Points . . . From Dept. to Dept. or Bldg. to Bldg.

Intra-plant communication problems vanish when TelAutograph Telescribers are used to expedite orders and messages. Here is THE rapid, accurate method. A message written on a TelAutograph Telescriber is immediately reproduced, in the sender's own handwriting, on instruments at other locations.

No delays. No disputes. One writing contacts all concerned. Both sender and recipient have a permanent record of the message. The resulting increase in efficency means a corresponding reduction of operating costs.

For further information about a TelAutograph Telescriber system to fit the needs of your organization write for Literature F.

TelAutograph CORPORATION

16 WEST 61st STREET NEW YORK 23, N. Y.

"Handwritten Messages Deliver Themselves... While You Write."

rate units are built for operation on 115 and 230 volts, 50/60-cycle a.c.
Thermo Electric Mfg. Co., 510 W. Locust St., Dubuque, Iowa.

•

Fluorescent Lamps

Improved fluorescent lamps are said to have an average rated life of 7500 hours when burning cycles average three hours or longer. Line covers complete range of bi-pin preheat lamps from 15 to 85 watts.
Champion Lamp Works, Lynn, Mass.

Valves

Two valves, check and needle types, for air and hydraulic applications, are compact, short, and slightly larger than the pipe size to provide consolidated piping arrangements. They are made of hexagon bar stock in brass for pressures to 1000 psi. and in steel for 5000 psi. All internal parts are of stainless steel. They are available in $\frac{1}{8}$- to $\frac{3}{4}$-in. pipe sizes, fuel thread.

The check valve is built with a floating ball said to be so sensitive that it opens full or closes completely at any change in flow direction. It may be converted to a fixed orifice control valve by drilling a predetermined reverse flow orifice through the entry port of the valve body. The other type has a long tapered needle which permits close Vernier adjustment for air and hydraulic service.
Pneu-Trol Devices, Inc., 3122 N. California Ave., Chicago 18.

•

Swivel Casters

Line of drop-forged swivel casters is made in extra heavy, heavy, and regular duty models. Semi-steel, molded plastic, or molded-on rubber-tired wheels are furnished in all models. The extra-heavy-duty models have 6-, 8-, or 10-in. wheels; heavy-duty, 5- or 6-in.; regular, 4- or 5-in. wheels. All models have Hyatt roller bearings; extra-heavy- and heavy-duty models, Timken thrust bearings.
The Hamilton Caster & Mfg. Co., 1662 Dixie Highway, Hamilton, O.

•

Tractor Lift Attachment

Device called Carry-Lift may be attached to Ferguson, Ford, and other types of tractors through the regular implement suspension points. Made of steel, it will handle loads up to 700 pounds. It may be converted from a platform to a fork lift. As platform lift, it may be used either with or without a back panel: pockets are provided for 2x4-in. stakes. Frame is punched for holding loads.

Used as a fork lift, carrier can pick up bulky material or skid pallets without manual loading. Brackets are provided for two 4-in. fork extensions for carrying long loads.
Pittsburgh Forgings Co., Coraopolis, Pa.

Humidifier

Developed to remove excess moisture from the air, electrically powered appliance, called The Oasis Air Drier, affords protection against mold, mildew, and rust. Manufacturer claims that it will take almost three gallons of excess moisture from the air every 24 hours in an average-sized closed area, under high temperature, high humidity conditions.

Device is equipped with a 1/6-hp. condensing unit, sealed in oil. Removable galvanized condensate container is standard equipment, but garden hose can be attached for drainage. Unit operates on 110-volt 50-60 cycle single-phase a.c., measures $12\frac{1}{2}$x20x$21\frac{3}{4}$ inches, weighs approximately 100 pounds.
The Ebco Mfg. Co., 401 W. Town St., Columbus 8, Ohio.

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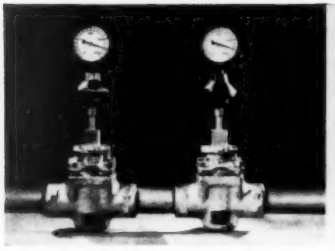
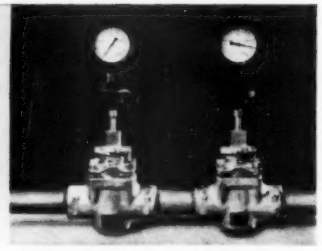


PRESSURES START the same—350 psi—for conventional lubricant (left gage) and for compressible lubricant (right), but . . .



GAGES SIX MONTHS LATER show that conventional lubricant (left) has lost all its pressure, while compressible lubricant is still at 340 psi.

COMPRESSIBLE LUBRICANT HOLDS ITS PRESSURE

Hypermatic is a compressible lubricant for Nordstrom-type valves. It will expand when pressure drops. The maker says it continues to maintain pressure to fill lubrication voids until confined pressure drops to 50 pounds. This eliminates the need for frequent relubrication, saves on maintenance and servicing costs.

Available in stick form or for use in a high-pressure grease gun, it is "energized" by the pressure applied as it is injected into the valve.
Nordstrom Valve Div., Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.

Rust Inhibitor

Ensign No. 395 metal preserver was developed for use as a rust inhibitor for metal in storage and transit, as well as for maintenance purposes, both interior and exterior. Seals surfaces with a dull-gloss black finish that resists acids, alkalis, and destructive fumes.

It may be applied by brush, spray, or dipping directly to rusted surfaces after the loose scale has been

NEED MORE "DRIVE" IN YOUR MACHINES?

Rex Light Chabelco . . . *for moderate loads*

Rex Universal Chabelco . . . *for heavy loads at higher speeds*

Rex 3100 Series Chabelco . . . *short pitch chain for high-speed service.*

If you want top performance from your machines . . . if you want drives that stand up under the toughest operating conditions, the Rex Chabelco Line of Chains and Sprockets is the answer.

Specifically designed for drive service on equipment where steady, uninterrupted service is a "must," these husky steel chains *deliver more H.P. per dollar* . . . assure low initial and operating costs . . . and freedom from production loss due to premature drive failure. Often a Rex Chabelco Chain, single or double strand, will handle loads that would require triple or quadruple strands in other types of chain.

Where service is exceptionally severe . . . where equipment must operate under conditions of dirt, dust and temperature extremes, a Chabelco Chain will keep going when other driving mediums would soon fail. Designed-in clearances between working parts enable it to operate efficiently under these conditions and to accommodate minor misalignments.

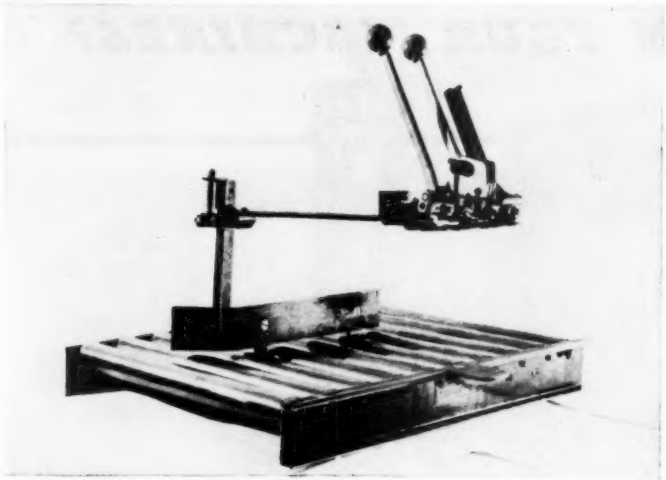
Many sizes of standard Rex Chabelco Chains and Sprockets are now available from stock. For all the facts on how they can help you put more "drive" in your machines at the lowest over-all cost, call your Rex Field Office or write Chain Belt Company, 1667 West Bruce Street, Milwaukee 4, Wis.

Rex Heavy Chabelco *. . . for heavy loads*

CHAIN BELT COMPANY — REX — DRIVE AND CONVEYOR CHAINS

brushed off, as it penetrates the residual rust to seal the metal against further ravages. Contains no pigment, may be used on steam pipes and heating systems, as it is said to be a good heat conductor. May also be used to seal concrete and waterproof wood.

Ensign Products Co., 3528 E. 76th St., Cleveland 5.



Conveyor Strapping Unit

Designed to speed up production line strapping, Model E10B1 conveyor strapping unit consists of a strapping tool mounted on a roller conveyor section. Manufacturer states that it is particularly suited to strapping corrugated or solid fiberboard boxes, but that it can also be used for other types.

The rigid tool mount is adjustable to accommodate packages ranging from 3 to 23 inches high. Backstop can be regulated for precise strap placement; steel lip on front edge of the unit prevents package from tipping while the center strap is being applied to the box.

Acme Steel Co., 2840 Archer Ave., Chicago 8.

EQUIPMENT PREVIEW: Highlights of important new items to be described more fully next issue

Portable Pump—This pump looks like a ⅜-in. electric drill, weighs about the same. Its high-speed continuous-duty motor delivers 40 gallons (one barrel) per minute. Trigger-switch handle regulates flow.

Meier Electric & Machine Co., Inc., 3525 E. Washington St., Indianapolis.

Electric Hammer Drill—The bit on this electric tool hammers and rotates at the same time. It will drill up to 2-in. holes. Automatic safety clutch on rotating drive slips if the bit binds. Percussive hammering can be stopped while bit continues to rotate.

Syntron Co., 480 Lexington Ave., Homer City, Pa.

Aerial Platform Ladder—Aluminum extension ladder may be attached to a materials handling truck, reaches high up to get at lighting fixtures, overhead piping, ceiling-height storage bins. Platform has guard rail, holds both man and his tools. Ladder inclines, rotates, retracts to half its length to be carried horizontally on top of the truck.

Aero Metalcraft Corp., Rockleigh, N.J.

Flexible Metal Gasket—Flexitallic gaskets combine ferrous and nonferrous metals. Made on the spiral-weave principle, they are resilient enough to withstand high pressures and high temperatures. They maintain a tight seal without the permanent "set" usually expected from metal gaskets.

Flexitallic Gasket Co., 8th & Bailey Sts., Camden 2, N.J.

Translucent Building Panels—Glass fiber baked in polyester resin makes up these weather-resistant panels. They may be nailed or bolted in place. Standard corrugations nest with corrugated metal and asbestos sheeting, making the panels particularly suitable for skylights.

Corrulux Corp., 410 Holmes Rd., Houston 5, Texas.

Heavy-Duty Arc Welder

Built in 300- and 400-amp. sizes, heavy-duty arc welder, called the Wilson 36A Yellow Jacket, is suitable for pipeline work or construction jobs. It is a d.c. 40-volt, variable voltage generator.

Current output is regulated by a handwheel on the control cabinet. Close calibration of dial eliminates need for meters, according to manufacturer, who states that for instant recovery voltage over short circuit, the generator is self-excited, with excitation of the main field obtained through an auxiliary brush. Powered by a 6-cylinder engine; available in stationary or portable models.

Air Reduction Sales Co., 60 E. 42nd St., New York 17.

•

Corrosion-Resistant Sheet and Plate

Developed for severe corrosion applications, alloy stainless steel, called Durimet 20, is now available in sheet and plate. It is suitable for handling sulfuric acid and other corrosives. Available in sheet, gages 24 to 11, and in plate ranging from 24 gage to ¾-in.

The Duriron Co., Dayton 1, O.

•

Extendible Vacuum Hand Tool

Flexible rubber-hose vacuum hand tool attachment is intended for use in cleaning ratchet-wheel assemblies, spiral conveyors, and similar equipment. It can be stretched to more than twice its length, bent in and around complicated machine parts without pinching or collapsing, claims its maker, combining suction with a massaging, loosening action.

Device may be attached to any industrial vacuum cleaner, and is available with a 2:1½-in. reducer, or 1½-in. connector, in 36-in. lengths.

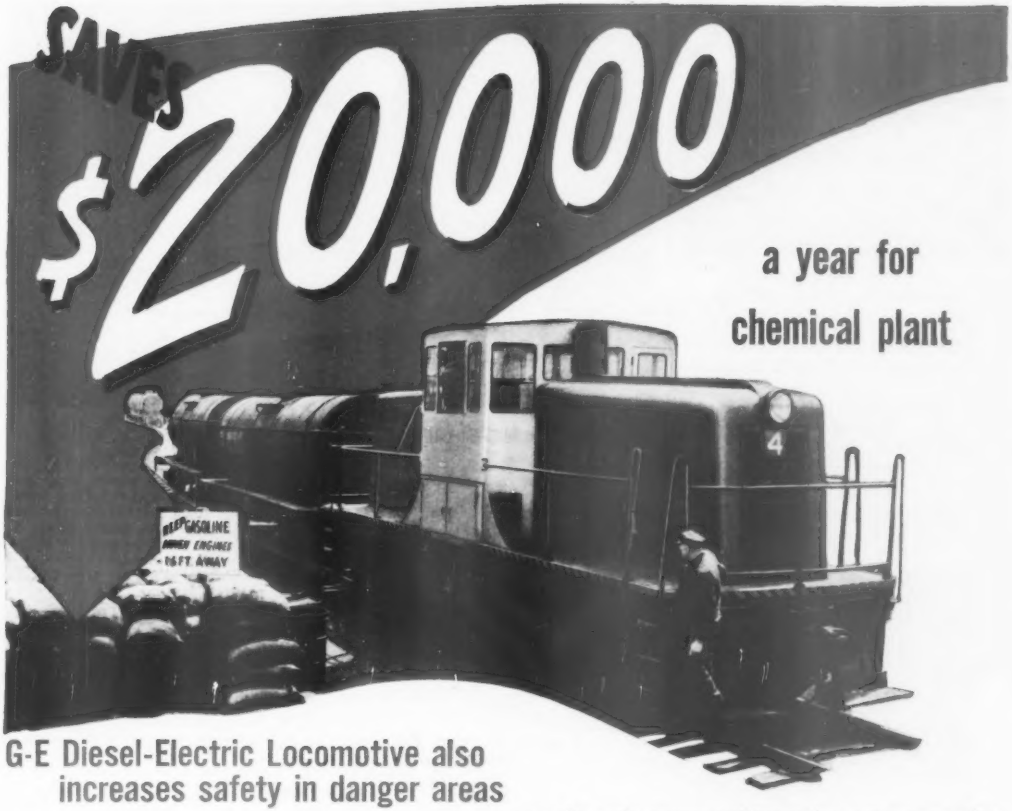
Doyle Vacuum Cleaner Co., 223 Stevens St., S.W., Grand Rapids 7.

•

Self-Sealing Coupling

Double self-sealing ¾-in. coupling, P1900 series, is said to shut off both ends of the line when uncoupled, with a minimum loss of fluid. It is claimed to be leakproof under applied or static pressures, or at 28 to 30 inches mercury vacuum. Over-all length is 4 15/32 inches; minimum clearance, 5¼ inches; maximum O.D., 1 21/32 inches; weight in brass, one pound.

Designed for low and medium



G-E Diesel-Electric Locomotive also increases safety in danger areas

Slashes switching costs $1700 a month! Ready for work 95% of the time! Gives maximum safety in inflammable areas! The Calco Chemical Division of American Cyanamid knows that it made a wise investment by purchasing a 65-ton G-E diesel-electric locomotive to replace steam operation.

ANNUAL RETURN—47%

Delivered May, 1946, this 65-tonner is one of two G-E built locomotives used for transfer work and intra-plant switching at Bound Brook, N. J. The purchase price was paid back in less than 2½ years. Hourly fuel costs were cut 84%. Derailments, more than one a week with the steamers, were eliminated. Maintenance expenses were sharply decreased; and time out for maintenance and inspection now averages just 5% of the 16 hour working day.

HOW YOU CAN BENEFIT

This performance is typical of G-E locomotives in industry. Your plant will reduce switching time up to 50%—will switch cars dependably and economically—will maintain the safest, cleanest working conditions possible—if you switch with G-E diesel-electrics.

The savings in your plant can be accurately estimated in advance. Your G-E representative will help you determine your needs. Call or write him today.

Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

GET THE FACTS ON LOW-COST SWITCHING!

- **Operating Results**
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Without obligation send me your fact-filled locomotive bulletin "Switch to Diesel-electrics and Save," GEA-4909.

Name .....

Company .....

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GENERAL ELECTRIC

THOMAS
Flexible ALL METAL COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

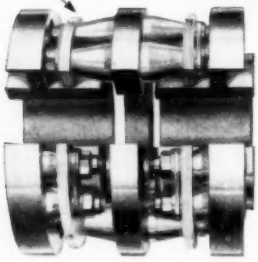
Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated
Lubrication is not required!

PATENTED FLEXIBLE DISCS



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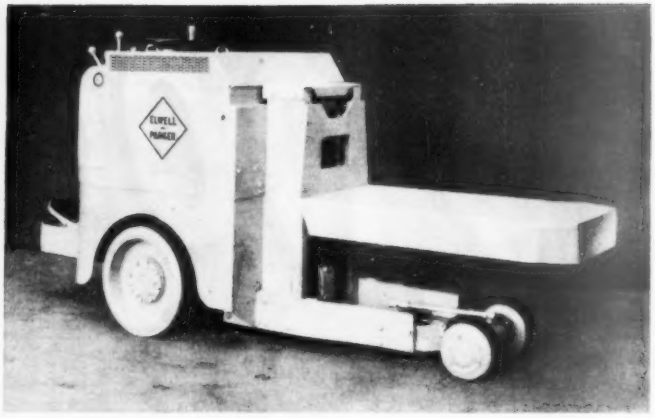
NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA



MEDIUM-RANGE LIFT TRUCK

Power truck has top-of-platform range of 12 to 36 inches. Design permits clear view of loads and areaways, maneuvering through low doorways, narrow passageways, and in elevators. There are no upright lifting columns; platform base moves vertically in a short column on the front of the truck.

Capacity ranges from 4000 to 10,000 pounds. Maker states that load may be raised or lowered from minimum to maximum level in less than one minute. Travel speed is 4¼ to 6 mph. Truck is equipped for either all-electric or gas-electric drive.

Elwell-Parker Electric Co., 400 St. Clair Ave., Cleveland 14.

pressure air, gas, and fluid applications, it is suitable for use on water coolant lines, soft water service, irrigation and sprinkler systems, as well as on air lines and pneumatic-operated devices.

E. B. Wiggins Oil Tool Co., Inc., 3424 E. Olympic Blvd., Los Angeles 23.

•

Splashproof Switch

Heavy-duty splashproof precision switch, with a plate-type actuator, is particularly suitable for use on equipment requiring two-hand control switches, states maker. Switch housing has a gasketed cover plate and a closely fitted actuator shaft through the housing wall, which serve to protect unit from dust, dirt, and the splash of oil, water, or coolant. Electrical rating is 15 amperes; 125-, 250-, or 460-volt a.c. Circuit arrangement is single-pole, double-throw.

Micro Switch, Freeport, Ill.

•

Turbine-Type Pump

Designed to run continuously without metal-to-metal contact, turbine-type pump is built with its impeller fastened to an enlarged shaft by a locknut and a Woodruff key. Construction features sealed-in-grease ball bearings and renewable heads and impellers. Bearing end-play is said to be prevented by the use of a pre-loading spring under the outer adjusting nut.

Roy E. Roth Co., Rock Island, Ill.

•

Line Marking Machine

Made of electrically welded steel, traffic line marker, called Little Giant Handi-Liner, is speedy, and may be operated with one hand, according to manufacturer. It is designed to make straight or curved continuous or skip lines and lettering. Visible gravity paint flow eliminates paint waste, and valve control permits adjustment of flow.

Lasting Products Co., 200 Block S. Franklintown Rd., Baltimore 23.

•

Outlet Box Cover

Plastic outlet box cover and switch housing is suitable for individual control of lights or power units and control of banks of lights up to 1250

MEASURE AIR OR GAS WITH

cash-register accuracy

(Above) Small-size R-C Meter with inclined differential gauge, with top inlet, and outlet in bedplate.

Large-size, low-pressure R-C Meter, side inlet box and bottom outlet, with a P.V.T.T. Recorder.

Built-in characteristics of R-C Positive Displacement Meters insure unfailing, long-time accuracy:

1. Accuracy is not affected by variations in specific gravity, rate of flow, pulsation, moisture or impurities.
2. Accuracy does not depend on uncontrollable factors.
3. Accuracy is not subject to adjustment of meter or recorder by operators.
4. Accuracy is not affected by reasonable overloads.
5. Accuracy is permanent because measuring chambers are surrounded by precision-machined cast-iron surfaces.

R-C Meters are built in 31 standard sizes, with capacities from 4,000 to 1,000,000 CFH. Indicating and recording instruments are available for all types. Send for details in Bulletin 40-B-14 or write us about your specific problem.

ROOTS-CONNERSVILLE BLOWER CORPORATION
910 Central Avenue, Connersville, Indiana

FOR HANDLING GAS OR AIR, CALL ON *R-C dual-ability*

Only Roots-Connersville offers you such an extensive line of air or gas handling equipment, including:

Centrifugal and Rotary Positive Blowers, Exhausters, Boosters

•

Rotary Liquid and Vacuum Pumps

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Positive Displacement Meters

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Inert Gas Generators

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For almost 100 years, our business has been the building of completely reliable air and gas handling equipment—*exclusively*.

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BLOWER BUILDERS R-C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ **ONE OF THE DRESSER INDUSTRIES** ★ ★

Here's 'ROUND-THE-CLOCK Jacking POWER
Plus SAFETY and EFFICIENCY

Simplex HYDRAULIC JACKS

Specifying Simplex Hydraulics puts Jacks to work at scores of jobs . . . steps up efficiency with dependable versatility plus these added advantages: Smooth hydraulic power; an extra safety margin; construction throughout that insures lasting service with minimum attention.

Simplex Hydraulic Jacks are available in eight models with capacities from 3 to 100 tons. The 30, 50 and 100 ton models have double pumps; others single pumps. All models are safety-tested to 50% over rated capacity.

CHECK THESE SIMPLEX-ENGINEERED FEATURES

- High-pressure packing seals of Neoprene.
- Non-sticking, spring controlled ball valves.
- Operate vertically or horizontally.
- Pressure-tested bases.
- Drop-forged steel caps.

SEND FOR BULLETIN: HYDRAULIC—49

1899 1949

Simplex
LEVER • SCREW • HYDRAULIC
Jacks

Tune in the RAILROAD HOUR
MONDAY NIGHTS ABC NETWORK

TEMPLETON, KENLY & COMPANY
1018 S. Central Avenue • Chicago 44, Illinois

watts. Listed as No. 109, it provides a 4½-in. cover and switch assembly for ceiling or wall-mounted outlet boxes, may be obtained with or without a switch.

McGill Mfg. Co., Inc., 777 Oak St., Valparaiso, Ind.

•

Axial-Flow Blower

Forced draft axial-flow blower incorporates a combined electric motor and steam turbine drive. Change from one drive to another can be accomplished by throwing a switch for the electric drive, or turning two valves for the steam.

Manufacturer states that a wide range of control is available with both drives, and that automatic operation may be arranged in connection with combustion control system.

The blower may be used as a vertical unit, or adapted to horizontal discharge by adding supporting feet. It is furnished in a completely assembled and aligned unit ready to bolt down.

L. J. Wing Mfg. Co., 154 W. 14th St., New York.

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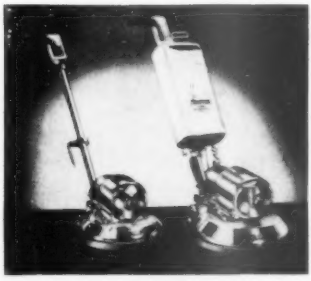

Floor Machines

Intended for dry or wet cleaning and maintenance operations, floor machine is equipped with a "Safety Grip" handle that can be adjusted through a 90-deg. swing to any angle for convenience of tall or short operators. It can be locked in vertical position or detached for storage or transportation. Each handle incorporates a switch to provide positive off-on action when gripped. This prevents the machine from starting accidentally when plugged in, and

ENTIRELY AT OUR COST

Thor

Free Trial in your plant

We want to invest in YOUR business!

Your problem today is to reduce labor and operating costs.

Thor has the answer to the problem—scores of *new . . . modern* power tools of all types, including the only complete new line (released in 1949) of electric tools in more than a decade.

Rather than invest in printed words to describe these new tools, Thor is choosing to let you see for yourself—at no obligation.

We are confident any Thor portable power tool will speak better for itself right on your job . . . and we'll invest the cost of the tool to prove it! Independent Pneumatic Tool Company, Aurora, Illinois.

Thor TOOLS

Postage Will Be Paid by Addressee

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BUSINESS REPLY CARD
First Class Permit No. 195, Sec. 34.9, P. L. & R., Aurora, Illinois

INDEPENDENT PNEUMATIC TOOL COMPANY
Trial Order Division
AURORA, ILLINOIS

PNEUMATIC AND ELECTRIC

IMPACT WRENCHES

The modern way to apply and remove nuts, bolts and cap screws

UNIVERSAL ELECTRIC

New 3/8" "Silver Line" all-purpose wrench; 2,000 powerful impacts per minute; weighs less than 7 pounds. (Ask for Circular 1025).

HIGH FREQUENCY ELECTRIC

New 3/4" Model D3W6; exceptionally powerful for heavy production; weighs only 8 3/8 pounds. (Ask for Catalog 61).

PNEUMATIC

17 models in 1/4", 3/8", 5/8", 3/4" and 1 1/4" capacities; three handles styles, side, lever and grip; exclusive Thor impact mechanism delivers heavier torque blow than any competitive wrench, maintains longer tool life; already widely accepted on all types of assembly and maintenance jobs in plants, fleet shops, garages, etc. (Ask for Catalog 52B).

OVER 1500 TYPES OF

Thor PORTABLE POWER TOOLS

FOR FREE TRIAL

- Universal Electric
- High Frequency Electric
- Pneumatic
- Mining and Contractors

BALANCERS
BUFFERS
CHIPPING HAMMERS
CLAY DIGGERS
CORE BUSTERS
DRILLS
FENDER HAMMERS
GRINDERS
HAMMERS
HOISTS
IMPACT WRENCHES
NAIL DRIVERS
NIBBLERS
NUT SETTERS
PAVING BREAKERS
POLISHERS
RAMMERS
REAMERS
RIVET BUSTERS
RIVET HAMMERS
ROCK DRILLS
SANDERS
SAWS
SCALING HAMMERS
SCREWDRIVERS
SHEETING DRIVERS
SPIKE DRIVERS
STAYBOLT HAMMERS
STUD SETTERS
SUMP PUMPS
TAMPERS
TAPPERS
TRENCH DIGGERS
VALVE REFACERS
VALVE SEAT GRINDERS
WAGON DRILLS
WOOD BORERS

SEND CARD TODAY FOR FREE TRIAL!

FREE TRIAL ORDER

Have Thor engineer call immediately to recommend Thor tool or tools we can order for free trial purposes.

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COMPANY _____

ADDRESS _____

CITY _____ STATE _____

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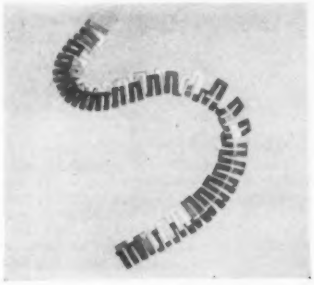
stops it automatically if operator loses control.

The 16-in. machine is powered by a ½-hp. motor, the 14-in. style, a 1/3-hp. motor. Speed of both is 1750 rpm.; brush speed 172 rpm.

Other features include replaceable rubber bumper guard, 15-qt. corrosion-resistant, wide-mouth tank. Control handle located above the tank regulates the flow of liquid. Standard equipment includes a tampico brush for general polishing and 50 feet of trailing wire; a variety of other brushes and attachments for special services are also available.

American Floor Surfacing Machine Co., 539 S. St. Clair St., Toledo 4, O.

•



Packing Expander

Designed in strip form to fit many diameters of packings on hydraulic equipment, "U" expander uses metal spring to exert mechanical pressure on lip of packing. It is designed to maintain contact with cylinder wall, or plunger, in cases where pressure is low or is built up slowly. This is said to prevent fluid leaking past packing.

Unit comes in ¼- to 1½-in. heights of rolled brass strip material. According to manufacturer, it is impervious to corrosion from brine solution, gasoline, alcohol, and other solutions.

HPL Mfg. Co., 2013 E. 65th St., Cleveland 13.

•

Safety Control Valves

Double-piloted single-plunger valves are suitable for use in safety control of presses, shears, cutters, air clutches, and for use in sequence operating cycles. The pilot cylinder can be operated at pressures as low as 25 psi. Valves consist of an aluminum housing, a hollow stainless steel plunger with precision-placed ports, and stainless steel pilot pistons mounted in brass pilot cylinders.

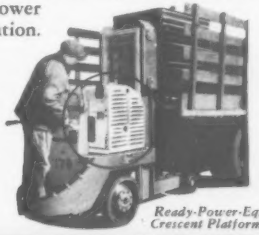
They can be disassembled and reassembled without disturbing the main piping, according to the manufacturer, and are tapped for either ⅛- or ¼-in. pipe connection. Avail-

IT WILL PAY YOU TO CONVERT TO READY-POWER

You can convert any electric industrial truck to gas-electric operation by installing a Ready-Power Unit.

Ready-Power-Equipped Baker Fork Truck

Ready-Power gas-electric Power Units are unequalled for completely dependable power, hour after hour, day after day. A Ready-Power Unit will be installed by an electric truck manufacturer on any new truck you order . . . but you don't have to wait for that because you can convert any electric truck you now have. Write The Ready-Power Co. today for complete information.



Ready-Power-Equipped Crescent Platform Truck

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

LIGHT as a TOUGH as a

CM

LIGHT WEIGHT—HEAVY DUTY

CYCLONE

96% Efficient
42% Fewer Parts
63% Less Weight

•

Sealed in Lifetime Lubrication

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Alcoa Aluminum Alloy

•

HERC-ALLOY Flexible Load Chain

Picture this: a high speed chain hoist that weighs only 35 lbs. for the 1 ton capacity model. No more struggling with slow, ponderous, outmoded hoists. The Cyclone can be carried around with ease. Lifts loads rapidly with an easier pull on the chain. Can take the rough handling of maintenance crews or the continuous duty of production application. Workmen are grateful... do their work faster, safer and better when they have a Cyclone.

AVAILABLE IN capacities from ⅛ to 10 ton.
For all the construction details write for Bulletin 145 C or phone your local distributor for a demonstration in your plant.

CHISHOLM-MOORE
HOIST CORPORATION
(Affiliated with Columbus McKinnon Chain Corporation)
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.
SALES OFFICES: New York, Chicago and Cleveland • Distributors Everywhere

able in 2-way, 3-way, double 2-way, 4-way, and 5-way designs for use with air, oil, or water at line pressures up to 125 psi., also vacuum, at temperatures not exceeding 150 deg. F.

C. B. Hunt, & Son, Inc., Salem, O.

•

Cable Cutter

Portable manually operated cable cutter has a downward circular cutting motion for slicing, rather than pinching cut. It is adapted to cutting hollow core material and steel reinforced rubber hose, as well as heavy electrical cable and conduit. Snap-action hold-down device permits size adjusment, and blades are adjustable to compensate for wear and resharpening.

Beverly Shear Mfg. Co., 3001 W. 111th. St., Chicago.

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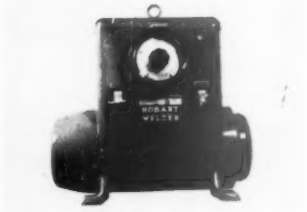


D. C. Arc Welder

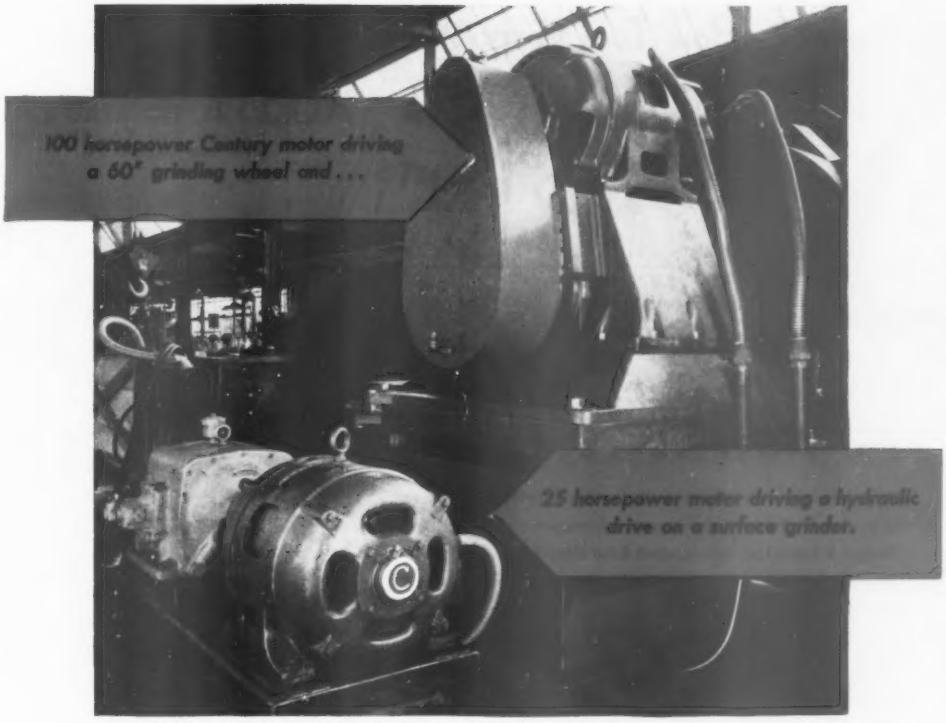
Electric-motor-driven d.c. arc welder, known as Bantom Champ, measures 26¼x18x25 inches, weighs approximately 340 pounds. Model MZ-200-S is rated 200 amperes at 30 volts on 50-per-cent-duty cycle. Current range is from 40 to 250 amperes at an operating speed of 3450 rpm. Welding controls are modified multi-range dual type, with five ranges of welding current and 100 steps of volt-ampere adjustment.

Hobart Bros. Co., Box 489, Troy, O.

•

Tool Set

Intended for maintenance use, tool set includes 68 items for trouble-shooting and repair work. Called Proto Master Set No. 9989C, it contains nine feeler gages and a holder; four punches and a chisel; seven combination box and open-end wrenches, with $^{3}/_{8}$- to $^{3}/_{4}$-in. openings;


100 horsepower Century motor driving a 60" grinding wheel and . . .
25 horsepower motor driving a hydraulic drive on a surface grinder.

100 H. P. Century MOTOR—Driving a 60" Grinding Wheel Provides a Smooth Production Combination

This 100 H.P. Century Motor operating a huge 60" surface grinder and the 25 H.P. Century motor operating the feeder mechanism, is one of the hundreds of thousands of Century drives used in the precision production industries.

The unusual freedom from vibration designed and built into Century motors, contributes to the precision grinding at the business end of the grinder that was intended by the manufacturer of this fine tool.

The rugged mechanical design of Century motors are suitable not only to precision applications like this but also for the heavy shock loads required in some industrial operations.

From Century's wide range of types and kinds of motors, in sizes from 1/6 to 400 horsepower, you can select the correct motor to meet the exact requirements of your machines. The properly selected Century motor on your machine tools, conveyors, processing machinery, etc., helps to increase productivity, keep maintenance costs low and reduce plant shutdowns caused by improperly applied motors.

Specify Century motors for all of your electric power requirements.

Century C MOTORS

Popular types and ratings are generally available from factory and branch office stocks

CENTURY ELECTRIC COMPANY

1806 Pine St., Saint Louis 3, Missouri

Offices and Stock Points in Principal Cities

-608

How Tool Costs Were Cut

12 WAYS IN 20 PLANTS

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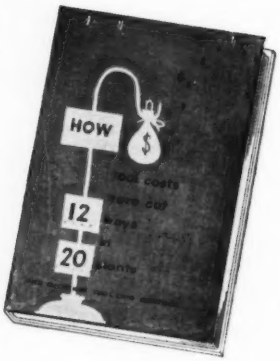
For NEW 12-Page Booklet

How savings start the day McCaskey Control takes over in a tool crib, told in the words of responsible plant executives. A report of results and how they have been secured, abbreviated to save your reading time.

For example, reduced purchases resulting from shrinking crib inventories and prevention of hoarding usually pay the McCaskey bill several times over. A dozen other immediate savings add up to substantially lower tool expense and improved operating efficiency.

Let us send you the facts . . . how McCaskey will help cut your tool costs, too.



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INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

four tappet wrenches; seven socket wrenches and six handles and attachments for ⅜-in. drive; nineteen socket wrenches and six handles and attachments for ½-in. drive; and a 20½x11½x9-in. tool chest with three trays.

Plomb Tool Co., 2209 Santa Fe Ave., Los Angeles 54.

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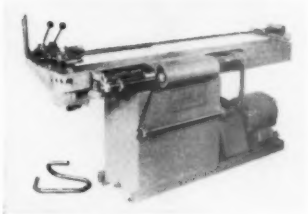


Tube-Bending Machine

Semi-automatic hydraulic bending machine, designed for work requiring frequent change of setups, is a self-contained unit. Called Series 1400, it will handle tubes and pipes up to five feet in length, but can be extended to take any length of tube. Its maximum rated capacity is for 1-in. O.D. 16-gage steel tubing, with maximum bending radius of 8½ inches to centerline of pipe.

Manufacturer states that it can be tooled to handle serpentine and stacked coil bends, and adapted to rolled or extruded sectons and bars. Bending process is controlled by two toggle-operated hand clamping levers and one manual hydraulic valve control lever. Bender is mounted on an 18x40-in. welded steel pedestal which serves as a reservoir for the hydraulic oil and as a base for mounting the motor, Vickers pump, and control valves. Machine can be bolted to the floor, or mounted on skid or dolly.

Pines Engineering Co., Aurora, Ill.

•

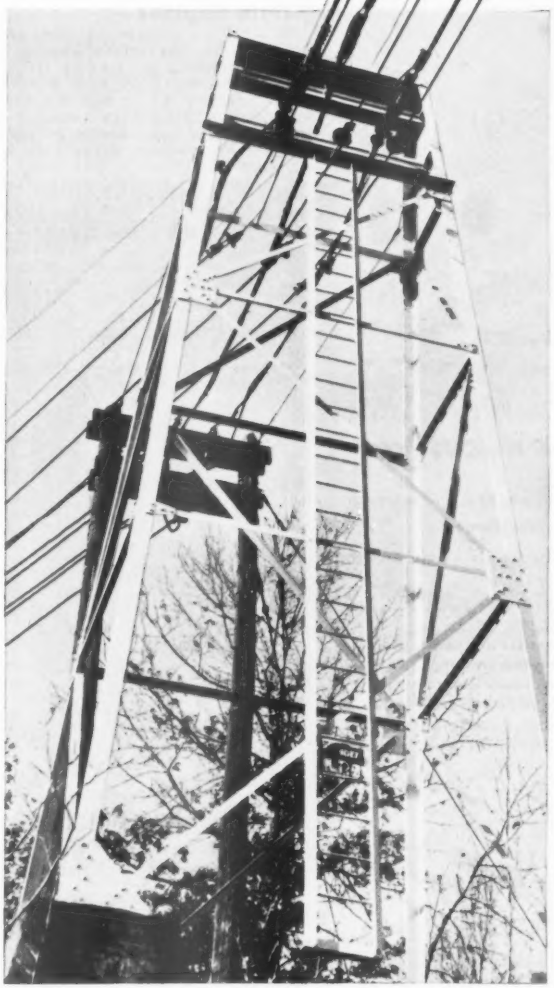
Hand-Tool Motor

Designed for use with manufacturer's attachments and accessories, No. 8 Stanley-Carter ½-hp. universal motor is built with an extra-large shaft to withstand vibration and mechanical shock. Ventilating system provides strong air blast to cool the motor and keep work surfaces clean. Accurately ground collet-type chuck will not slip, according to maker.

Motor can be used with manufacturer's RS8 router-shaper, R8 router,

MORE DATA ON ALCOA EC ALUMINUM

Lighter weight, lower cost . . . on the job today



Q ***How does ALUMINUM compare on tensile and breaking strength?***

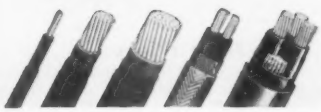
A ***Tensile strength of ALUMINUM conductor is higher than copper wire for comparable duty.***

Insulated wire and cable made with Alcoa E.C.* Aluminum is specified two AWG sizes larger than copper if same voltage drop or power loss is desired. If specified for same carrying capacity (temperature rise) the aluminum conductor has approximately 36% larger cross section than copper. In both cases, the aluminum conductor is stronger. And the ratio of strength to weight is much greater. For example, aluminum can sustain at least twice the length of vertical riser permissible with copper conductors.

You get greater tensile breaking strength—you get lighter weight and lower costs—with wire and cable made with Alcoa E.C. Aluminum. Alcoa makes light, strong, conductive E.C. Aluminum; leading wire manufacturers draw, strand and insulate it, and sell it under their own trade marks. Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 1900 Gulf Building, Pittsburgh 19, Pennsylvania. *E.C.: *Electrical Conductor* Aluminum

◄ MOSINEE PAPER COMPANY

1,500,000 cm T.B.W.P. all-aluminum cable river-crossing span 800 ft. long. Three aluminum cables, two iron shield wires above and an additional circuit of 400,000 cm copper underneath. Installed in 1914. Carries load up to 1000 amperes. A double circuit of 400,000 cm copper is paralleled and connected to the 1,500,000 cm aluminum cable by use of aluminum parallel groove clamps. Clamps are bare and have not been changed since installation in 1914.



ALCOA ALUMINUM

FOR ELECTRIC WIRE AND CABLE

we love this kind of an executive

He isn't interested in broad, vague claims. Facts and figures make up his mind. He's easy for us to talk to because our story ties in with *cutting costs* of his packing and shipping, with increasing his production, with stepping up his profits.

We believe *every* user of shipping containers will today, more than ever before, find our story of interest—*to his interests!*

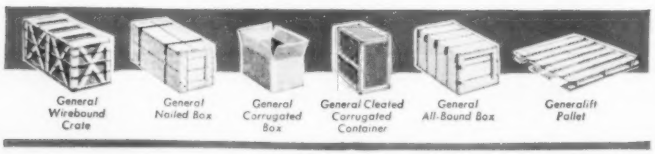
Write us for details—write *today.*

Our two modern, fully equipped, expertly staffed Designing and Testing Laboratories are available for the improved packing of your products. Get in touch with us with regard to this free service.

General BOX COMPANY ★★★★★ **...engineered shipping containers**

GENERAL OFFICES: 504 N. Dearborn St., Chicago 10.
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon, Natchez.
Continental Box Company, Inc.: Houston, Dallas.

Send for your free copy of "THE GENERAL BOX"



J3 power plane, toolpost grinder, benchstand grinder, WS8 weatherstrip groover, dovetail attachments, and other accessories.

Stanley Electric Tools, New Britain, Conn.

•

Safety Glasses

Two models of safety glasses are designed for use where explosion or spark hazards are present. Designated Y-40 and Z-79, both feature acetate frames which will not support combustion. Manufacturer states that they are particularly suitable for use by workers whose skin is sensitive to metal.

The two are similar except that Z-79 has acetate side shields, perforated for ventilation, while the Y-40, without shields, is intended for protection against frontal impact. When equipped with glare-protection Ray-Ban lenses, they may be worn by furnacemen, spot welders, and other workers in semi-hazardous areas where both glare and impact hazards prevail.

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.

Flowmeter

Featuring a magnetic clutch, flowmeter, called the Hays-Penn Magna-Clutch, is designed with a 3.75-in. float and a 1.5-in. float travel, said to provide high power with a minimum of friction. Movement of the float is transmitted through a pressure-tight manometer by means of the magnetic clutch. Five range tubes are adjustable from 17- to 750-in. water differential. Working pressures are 1500 and 2500 psi., convertible in the field. Six types or combinations of recording, indicating, and integrating meters are available.

The Hays Corp., 1942 Shirl Ave., Michigan City, Mich.

•

Slip-Joint Pliers

Combination side-cutter slip-joint pliers are available in 5-, 6-, 7-, 8-, and 10-in. sizes. The cutters are designed

AO PANORAM Goggles

Workers have a "first row orchestra" view of the work with "Panoram"

AO's Wide-Vision Safety Goggle!

The AO Panoram Goggle is available in the following models:

NO. 600 — Clear Frame, Clear Lenses
NO. 601 — Clear Frame, Green Lenses
NO. 602 — Green Frame, Clear Lenses
NO. 603 — Green Frame, Green Lenses

Seeing area is at a maximum in this wide-vision goggle. Worn over prescription glasses or worn alone, its plastic frame, eyecups and replaceable lenses in either clear or green acetate provide snug, face-conforming protection. Eyecups vented at top and bottom assure ample ventilation and minimize clouding of lenses. Bridge is the floating saddle type that fits comfortably without pressure. Elastic headband is extra wide and easily adjustable.

The AO Panoram Goggle protects against foreign particles attacking from any direction. It is recommended for chipping, grinding, babbitting, riveting, rail cutting, spike driving, spot welding, hand tool and similar operations. Your nearest AO Representative can supply you.

American Optical Company
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

Unique Fenwal Thermoswitch* Thermostat Amazes Heating Experts by Performing the "Impossible!"

YES, manufacturers are discovering the remarkable line of Fenwal THERMOSWITCH* units can give them help they thought mechanically impossible! A coal furnace manufacturer, for instance, found the Fenwal THERMOSWITCH* the *only* thermostat able to solve the problem of automatic grate shaking. Ordinary thermostats either could not stand up under punishment . . . or were too slow in operation.

You, too, can benefit from this unbeatable THERMOSWITCH* performance. It has countless applications, does away with costly control equipment, opens up new forms of precision-control in all types of manufacturing processes. Low upkeep cost, too. The THERMOSWITCH* is accurate, rugged and simply constructed, with mechanism fully enclosed by the temperature-sensitive shell. Investigate it now!

FENWAL INCORPORATED
23 Pleasant St., Ashland, Mass.
Temperature Control Engineers

Fenwal

WRITE FOR BULLETIN ON

THERMOSWITCH*

*Reg. U. S. Pat. Off.

The Precision Thermostat For Temperature Control and Detection

SENSITIVE...*but only to heat*

so that one side grips the nail or wire with fine serrations to eliminate slipping.

J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y.

•

Rope Swivel

Wire rope swivel has double roller bearings and will swivel under full load, according to maker. Features include both thrust and radial roller bearings, heavy load capacity in relation to size, permanent lubrication, and replaceable parts. Available in five models ranging from ½- to 1½-in. wire rope sizes; four types of ends: eye bolt, hook bolt, integral eye, or clevis.

Flexo Machines Co., 456 N. Aberdeen St., Chicago 22.

•

Capacitor

Pole-type, 3-kvar. capacitor is housed in single container 8 inches wide, 13 inches long (exclusive of terminals) and 4½ inches deep. Mounting brackets are welded to case. Unit features built-in discharge resistors and fuse links within each sealed unit, and is rated at 240 volts a.c., 60 cycles, single phase.

Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., S. Plainfield, N. J.

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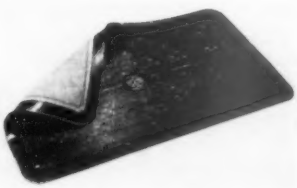


Rubber Mat

Sponge-rubber backing of fatigue mat is held in place by interlocking lips to keep it from separating. Sur-

Two views of a steel mill table roll body cast of Meehanite Metal by the Shenango-Penn *Centrifugal* process, assuring exceptional life. Note exterior and interior machining. Shenango-Penn facilities include modern equipment for economical machine work of virtually every type and to any stage to best meet your particular needs.

Maybe you can profit by steel mill experience

THIS conveyor roll is going to save a steel mill some money. Because it is a Shenango-Penn *centrifugal* casting of Meehanite Metal, it will hold up longer than an ordinary roll . . . won't need replacement nearly so soon! That's good economy, don't you think?

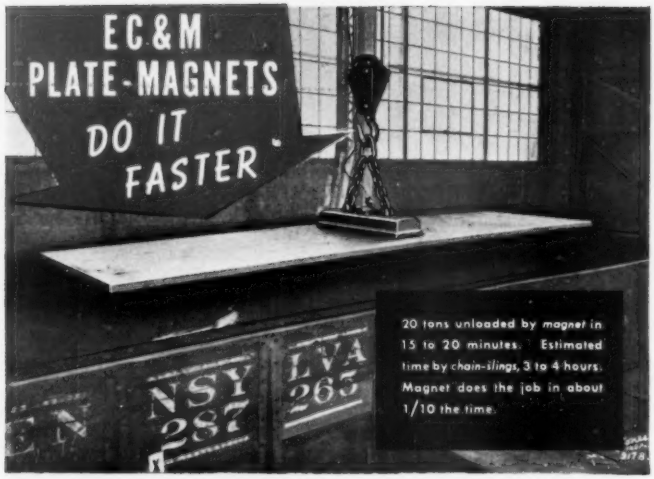
Fundamentally that's why Shenango-Penn is producing symmetrical, annular and tubular parts, large and small, ferrous and non-ferrous, for many services in many industries. The Shenango-Penn *centrifugal* casting process results in more uniform, pressure-dense parts with finer grain, greater strength, superior wear resistance and freedom from sand inclusions and blow holes. Metal for metal, dollar for dollar, they do a better job. It pays!

As always, we welcome the chance to give you further evidence, specific facts, as to why it will pay *you* to specify Shenango-Penn. Send for a free bulletin on our ferrous or non-ferrous made-to-order centrifugal castings or on our *centrifugally cast* bronze bushing stock in standard sizes.

SHENANGO-PENN MOLD COMPANY
2877 West Third Street · Dover, Ohio
Executive Offices: Pittsburgh, Pa.

SHENANGO-PENN

ALL BRONZES • MONEL METAL
NI-RESIST • MEEHANITE METAL®


EC&M
PLATE-MAGNETS
DO IT
FASTER
20 tons unloaded by magnet in 15 to 20 minutes. Estimated time by chain-slings, 3 to 4 hours. Magnet does the job in about 1/10 the time.

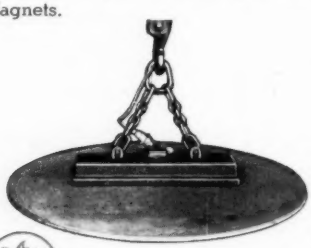
SAVE UP TO 90%

IN UNLOADING TIME

Here's a plant that uses several EC&M Plate-Magnets in the loading, unloading, stacking and processing of their plates, sheets, bars, pipe, etc. On long pieces, they use two magnets on a spreader-bar.

These EC&M Magnets not only reduce operating costs but they speed up handling. Railroad cars or trucks are loaded or unloaded without delay and handling throughout the plant is fast. There's no prying to affix chains and no danger of pinching hands when securing chains.

Send us the complete facts of your handling needs, so that we may write fully when sending Bulletin 903 describing EC&M Plate-Magnets.



TELL ALL FOR PROMPT RECOMMENDATION

Give an idea of your plant layout and equipment, and material handled, such as

1 - Style and capacity of crane.
2 - Voltage available (direct current is required for magnets).
3 - Overall dimensions and weight of material handled.

Burned Plates, too, pull out easily when lifted by Magnet.

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

face is molded in a ribbed design to provide traction and facilitate cleaning. Mat has tapered nontrip edges, and is made in marbleized black or brown.

The B. F. Goodrich Co., 448 S. Main St., Akron, O.

•

Alternate-Contact Switch

Designed to transfer circuits or provide on-off action with a single pushbutton, Type ACO switch utilizes lever-latch mechanism to maintain the circuit condition established by the pushbutton. In the SPST model ACO-A, the first press closes the contacts, which remain closed until a second press re-opens them. In the SPDT model ACO-C, first press transfers the switch contacts, the second restores the initial circuit condition.

Switch, lever-latch mechanism, and pushbutton are assembled on a rigid cast frame with mounting holes. Overall dimensions, 1 3/16x 1 9/16x1 5/8 inches. Both models are rated at 10 amperes, 125 volts a.c.

General Control Co., 1200 Soldiers Field Rd., Boston.

•

Safety Spectacles

One-piece lens of safety spectacles, called Saf-I-Spec, can be replaced or adjusted, and the detachable temples may be placed on the outside edge of the lenses wherever most comfortable. Molded sweat-bar on the lens provides rigidity and keeps it in alignment. Lenses are optically correct, made of safety plastic called Optilite, and are available in crystal clear or anti-glare green. They are light in weight, and may be worn over regular glasses.

U. S. Safety Service Co., Kansas City 6, Mo.

•

Totally-Enclosed Air-Cooled Motor

Air-cooled ball-bearing motor, Type TEFC, is polyphase, 50 or 60 cycle, constant speed, continuous duty, squirrel-cage induction type, with high torque and low starting current. Power sizes range from 2 to 60 horsepower. Manufacturer claims that actual temperature rise on the stator windings will not exceed 55

The 25-year Fenestra Holorib ceiling and roof of the P. G. Vincent Cigar Co., Cleveland. Architects—Cavanaugh & Baer

AFTER 25 YEARS—*As Good as New!*

Back in 1924, a couple of months before Calvin Coolidge was elected President, the sturdy roof and ceiling you see above was installed for the P. G. Vincent Cigar Company of Cleveland.

Now—25-years-of-wear later, that Fenestra* Holorib roof is *still as good as new!*

In fact, the present occupants of the building say they haven't even noticed the ceiling in the 12 years they've been there. Why should they? It's never given them a minute's trouble. That's something to remember—if you want permanent protection for your buildings.

WHAT HOLORIB STEEL DECK IS:

Strong, lightweight, smooth-surfaced roof sheathing in 18 or 20-gauge sheets 18″ wide and as long as required for multiple purlin spacings up to 24′. Each sheet is self-reinforced by three 1½″ deep ribs running lengthwise, spaced on 6″ centers. The pyramidal rib shape provides a broad base for bearing and welding, and narrow rib openings minimize asphalt loss during mopping of insulation. Rib shape—plus the exclusive telescoping end-lap and interlocking side-lap features—is the key to the tremendous strength and rigidity of Holorib installations...the key to the 25-year line of successful Holorib installations.

WHAT HOLORIB DOES:

Holorib Roof Deck, welded directly to purlins, forms a flat roof easily covered with insulation and waterproof roofing. Economical and easy to erect, Holorib gives you an attractive, noncombustible, long-wearing ceiling.

For a roof and ceiling that stands up to time's test of all around service . . . use Holorib Steel Roof Deck. Also check on Fenestra D Panels for floors, insulated C Panels for walls. You'll be glad you did. For further information, mail the coupon.

*Trademark

Fenestra

METAL BUILDING PANELS

ROOFS · WALLS · FLOORS

DETROIT STEEL PRODUCTS COMPANY
Building Panels Division
Dept. FM-10, 2266 E. Grand Boulevard
Detroit 11, Michigan

☐ Please have an engineering representative call.

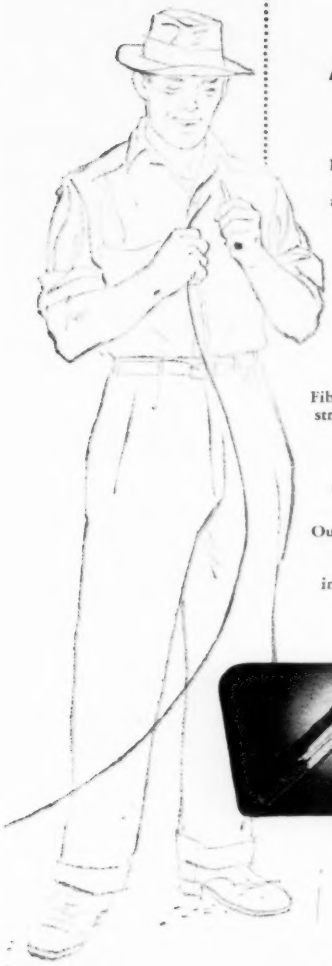
☐ Please send me, without obligation, information on Fenestra Building Panels.

Name _____

Company _____

Address _____

because they don't rot....FIBERGLAS* Yarns



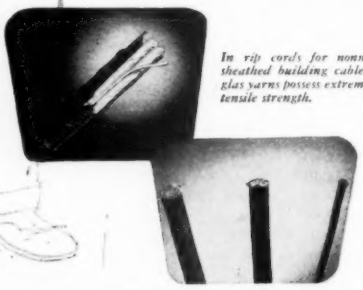
ARE WORTH LOOKING FOR IN BUILDING WIRE AND CABLE YOU INSTALL

Fiberglas glass yarns . . . used in both nonmetallic-sheathed building cable and rubber-covered building wire . . . *don't rot . . . don't absorb moisture . . . don't burn. They do resist corrosion.* Result—Fiberglas yarns have long life, really long life.

Long life is a good property to have in materials used to make building wire and cable you install. *Especially when you don't have to pay a premium for it!*

Fiberglas yarns also provide high impact strength, and have high tensile strength combined with low build-up. They make it possible to produce rubber-covered building wire that is strong and small in diameter, and which can be easily pulled through conduits.

Our new catalog of Fiberglas glass-base electrical insulating materials has a section devoted to wire and cable insulation. Send for it. Owens-Corning Fiberglas Corporation, Textile Products Division, Dept. 861, 16 East 56th St., N. Y. 22.



In rip cords for nonmetallic-sheathed building cable, Fiberglas yarns possess extremely high tensile strength.

The Fiberglas yarns used in these braids are not only rot-resistant but flame-resistant, moisture-resistant, and corrosion-resistant as well.

OWENS-CORNING FIBERGLAS Yarns

*Fiberglas is the trade-mark (Registered U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

deg. C., and that ball-bearing temperature rise is not over 30 deg. C.
Valley Electric Corp., Dept. 101, 4221 Forest Park Blvd., St. Louis 8.

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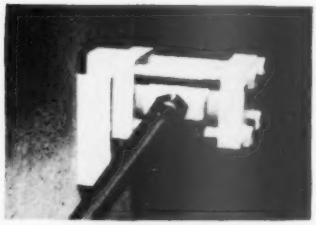

Pneumatic Vibrator

Type UH pneumatic vibrator may be attached to forms, mold boxes, hoppers, screens, fatigue testing, or other applications where vibrator installation cannot be permanent. Designed to withstand continuous use. Milled steel hook fits into brackets which may be welded or bolted to the item to be vibrated. Operates on 50 to 100 psi. line pressure; speed and intensity of vibration can be controlled by regulating the air pressure.
Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13.

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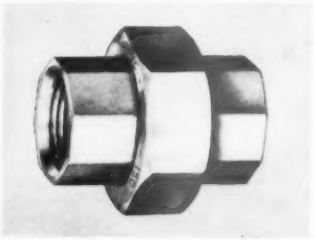

Steel Union

Intended for low-pressure, 150-lb. service, steel union, called PIC R, has ends made from polygonal steel pipe coupling stock to permit the use of open-end wrenches in close quarters. All steel surfaces are zinc-plated, even under the wedge-type bronze seat and on the threads.
E. M. Dart Mfg. Co., Providence, R. I.

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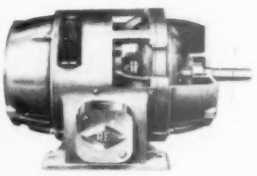

Motors

Called Fluid-Shaft, line of electric motors features a single-frame, integral design of motor and fluid-drive coupling. Suitable for use on conveyors, extractors, bridge and trolley drives on cranes, winders,

Putting Air to Work!

Here is another typical example of DeVilbiss' engineering "know-how." This spray booth, built specifically for the Ceramic finishing industry, recovers up to 99.3% of over-sprayed solids. Only one moving part—the blower—does the work. There are no nozzles, no pumps, no piping—nothing to wear out!

Here is a unique but unusually effective method of putting air to work. This tribesman owes his existence to a *Blowgun* . . . an ancient but lethal weapon still used in remote sections of Borneo. The Blowgun operates like a "beanshooter" with air power from the lungs employed to discharge a poisoned dart at great speeds and with amazing accuracy.

Wherever industry thrives you'll find another effective method of putting air to productive work. For example *spray guns* and complete spray systems designed and built by DeVilbiss enable manufacturers to operate so much more efficiently, they can produce for less—sell for less and do more business. The unsurpassed speed of these systems saves valuable manhours, cuts costs, increases production and improves the beauty and durability of finished products.

Wherever you have a painting or finishing operation, chances are a DeVilbiss engineer can prove to your complete satisfaction how you'll be ahead with the correct DeVilbiss equipment.

THE DEVILBISS COMPANY • Toledo 1, Ohio

Canadian Plant: WINDSOR, ONTARIO

DE VILBISS *means* **Quality** *in all four . .*

DEV

SPRAY EQUIPMENT
EXHAUST SYSTEMS
AIR COMPRESSORS
HOSE & CONNECTIONS

Inadequate vision is often unsuspected until discovered and corrected. Be sure that none of your employees is being penalized by trying to work with unsafe inefficient vision like this.

Workers who are fitted with B&L Safety Eyewear, incorporating professionally-prescribed correction lenses for their jobs, have benefit of clear sharp vision like this. Safer . . . more efficient!

SAFE EYES?

EYE SAFETY is a TWO-IN-ONE program

Industry-wide figures show that fully 50% of workers need eyesight correction if they are to have clear vision. Without it they can work neither efficiently nor safely. Your Bausch & Lomb distributor will help you build your eye safety program on the basis of *protection plus correction. Protection* against the hazards which can cause costly eye accidents. *Correction* lenses professionally prescribed where needed. Your reward will be a better safety record and a better production record.

Write for a copy of the Bausch & Lomb catalog on industrial eyewear. It includes a highly informative discussion of the theory and design of protective industrial eyewear. It also describes the complete line of Bausch & Lomb Occupational Eyewear, the eyewear built to the highest quality standards in the industry. Bausch & Lomb Optical Co., 650-J St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB *Safety Eyewear*

and mixers. It is claimed that all starting and operating shocks are absorbed in a cushion of oil to protect against possible "jamming" of equipment.

Motors are available in standard foot mounted, or round body frames, for horizontal or vertical mounting, or with NEMA flange-and-face-type end bells. Sizes range from ½ to 10 horsepower. When combined with manufacturer's motoreducers, available in either single or double reduction types, they provide fluid-drive, electric motor, and gears for slow output speeds in one power unit.

Reuland Electric Co., Alhambra, Calif.

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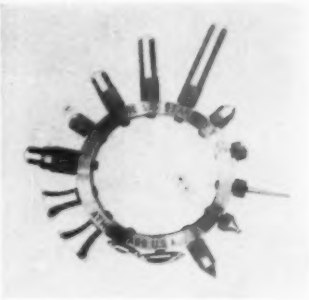


Dial Indicator Point Selector

Intended as an aid to those who make frequent use of dial gages, dial indicator point selector provides a selection of fourteen frequently used interchangeable contacts in one unit. Points are mounted in tapped holes on a lightweight aluminum ring. Each contact is identified by size or number stamped on the ring. All have a 4-48 mounting thread to fit any American Gage Design indicator.

The L. S. Starrett Co., Athol, Mass.

•

10-Ton Diesel Crane

Engineered for high-speed work on light jobs, 10-ton diesel locomotive crane, Model 410, is powered by

Handle it "THRU-THE-AIR" Dependably!

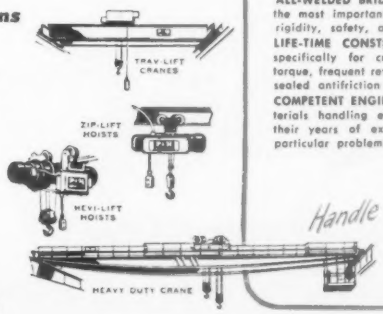
There's only *one* Trav-Lift! P&H builds it! But it's available in capacities up to 15 tons — with various lifting speeds and spans — with floor or cage control. In short, your Trav-Lift is tailored to fit your specific needs.

Designed and built with the same safety factors as a heavy-duty crane, standardized designs and lower costs make the Trav-Lift your best bet wherever service needs do not warrant investment in a heavy-duty crane.

Dependable? It's a product of P&H — America's leading builder of overhead materials handling equipment!

Trav-Lift Capacities Run up to 15 Tons

See how the P&H Trav-Lift Crane can bring you new and broader economies in materials handling. Write for Bulletin H-13.



These added values protect your investment

VARIABLE SPEED FULL MAGNETIC CONTROL provides 5 distinct steps for all motions; controlled from pendant push-button or from operator's cab.

SAFE — Only 110 volts at the push-button when floor-controlled. Start-stop main line contactor, disconnect switch, thermal overload protection, magnetic limit switch and powerful brakes assure maximum safety.

ALL-WELDED BRIDGE AND TROLLEY incorporates the most important factors in reliable service — rigidity, safety, accessibility.

LIFE-TIME CONSTRUCTION — Motors designed specifically for crane service — high starting torque, frequent reversal, etc. Shaved gears, grease sealed antifriction bearings throughout.

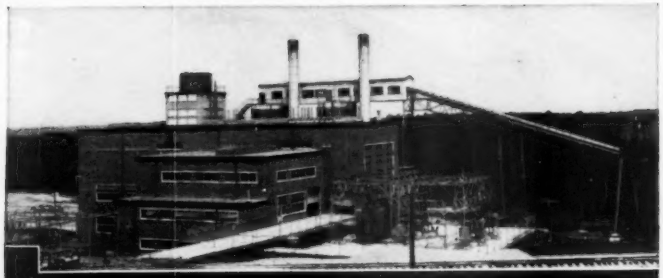
COMPETENT ENGINEERING SERVICE — P&H materials handling engineers will gladly give you their years of experience in working out your particular problems. Write us.

Handle it "thru-the-air" at lower cost

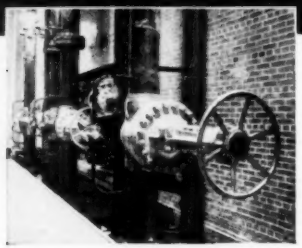
P&H

TRAV-LIFT CRANES
4525 West National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION



More power to Springs Bleachery through LUNKENHEIMER VALVES



ARCHITECTS AND ENGINEERS:
Robert & Co., Inc.
Atlanta, Ga.

CONTRACTORS:
Grinnell Co., Inc., Charlotte, N. C.

Springs Cotton Mills' Bleachery Division at Grace, S. C., is an outstanding development of one of the nation's largest textile manufacturers.

The power plant is based upon two 150,000 lb. per hour boilers. Large numbers of Lunkenheimer Valves including main steam, boiler feed, check and non-return valves, as well as small and large valves ranging from 125 to 1500 lb. standard for miscellaneous services, are used to control the power and process steam, powerhouse water supply, processing and fire protection.

This modern installation is another interesting example of the high regard in which Lunkenheimer Valves are held throughout all industry. If you are planning new construction or modernization of present facilities, it will pay you to specify Lunkenheimer Valves. Their reputation for lower-cost, trouble-free service is industry-wide.

CALL YOUR DISTRIBUTOR

He has the experience and the stock to serve your needs.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI 14, OHIO. U. S. A.
NEW YORK 13 CHICAGO 6 BOSTON 10 PHILADELPHIA 34
EXPORT DEPT. 318-322 HUDSON ST. NEW YORK 13, N. Y.

an electric-starting diesel engine. It develops 72 horsepower at 1600 rpm., has a rated capacity of 20,000 pounds, with a 40-ft. boom at 12-ft. radius. Equipped with a full-vision cab, it has tandem band air-controlled clutches, and will perform all operations simultaneously.

Three-speed selective transmission allows shifting from one speed to another while the crane is in motion. Single-line hoisting pull is 7500 pounds at 235 fpm.

American Hoist & Derrick Co., 63 S. Robert St., St. Paul 1, Minn.

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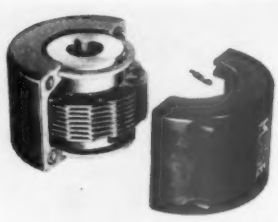

Plastic Coupling Covers

Plastic covers for chain couplings are molded of rag-filled phenolic plastic for maximum strength with minimum weight. The material used is said to be resistant to practically all acids and alkalies and to be rust-proof. Two-piece construction with slot-head screws permits application after the coupling has been installed.

Morse Chain Co., Div. of Borg-Warner Corp., 7601 Central, Detroit 8.

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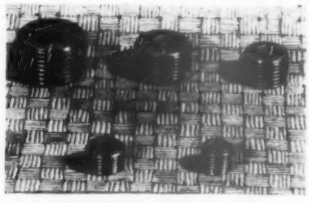

Steel Pipe Plugs

Standard countersunk pipe plugs are made on automatic screw machines in $\frac{1}{4}$-, $\frac{3}{8}$-, $\frac{1}{2}$-, $\frac{3}{4}$-, and 1-in. sizes. They can also be furnished to special order in alloy steels, aluminum, or brass in sizes up to $2\frac{5}{8}$-in. diameter.

J. J. Tourek Mfg. Co., 4710 W. 16th St., Chicago 50.

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Hydraulic Pump

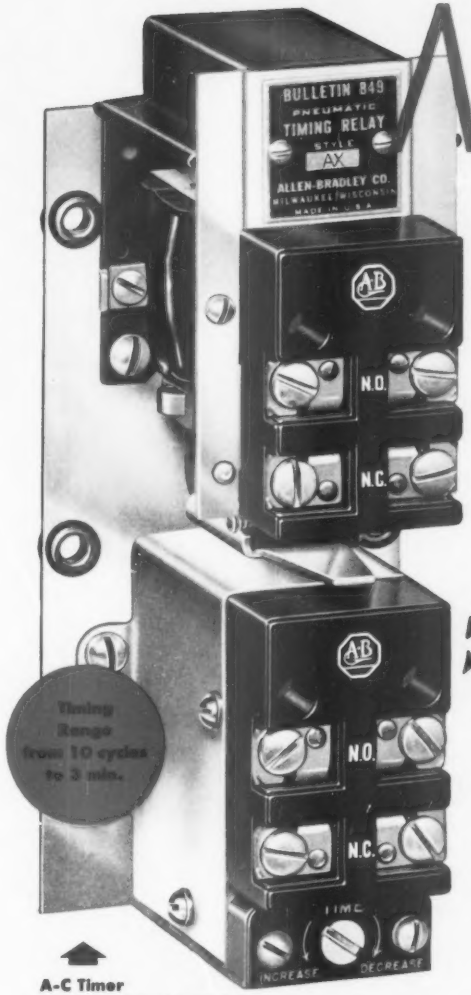
For use in operating hydraulic materials-handling elevating equip-

NEW...

Bulletin 849

PNEUMATIC TIMING RELAY

Good for Millions of Operations



A-C Timer with Auxiliary Contacts

D-C Timer

- FOR "DASH UP" OR "DASH DOWN" OPERATION
- AVAILABLE FOR NEMA TYPE 1, 4, 7, and 9 APPLICATIONS

This new, compact, solenoid type, pneumatic timing relay utilizes a synthetic rubber bellows for controlling the tripping time. Has a range of from 10 cycles to 3 minutes, and an accuracy of approximately ±10%. Its setting is easily adjustable over a wide range, and the relay resets instantaneously. This timer will provide satisfactory operation irrespective of temperature, humidity, or vibration conditions. Available with quick make and quick break, double pole, silver alloy main contacts—one set normally open and one set normally closed. Terminals are readily accessible from the front. A duplicate set of contacts for pilot control can also be provided, actuated directly from the solenoid. The unit can be readily changed from "dash up" to "dash down" operation by simply inverting the solenoid. Write for information on this new Bulletin 849 Pneumatic Timing Relay.

ALLEN-BRADLEY CO.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

OTHER RELIABLE TIMING RELAYS

TO FIT YOUR REQUIREMENTS

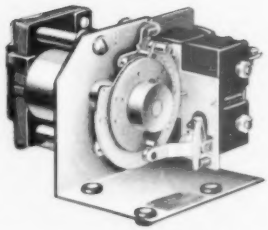
A-B Quality

BULLETIN 850
MOTOR DRIVEN TIMING RELAY

Designed for timing comparatively long intervals with a high degree of accuracy where high speed recycling is not required. Furnished in several ranges with a maximum time delay of from 1 to 15 minutes. Variations in time between successive operations are less than 1% of the full scale range. Its synchronous motor is suitable for a-c pilot control service only. Has a single pole switch for normally open or normally closed operations.

BULLETIN 850
TYPE L LAUNDRY TIMER

Similar in design to the Bulletin 850 Motor Driven Timing Relay, this timer is specially designed for controlling washing machines and other equipment where the motor is run for a given period in one direction, reversed, and then run in the opposite direction.



BULLETIN 852
ELECTRONIC TIMING RELAY

Designed primarily for exact timing in frequent operation. It has a range of 20 to 1 and is provided in eight timing ranges with from ½ second up to 2 minutes maximum time delay. The reset time is approximately one-tenth of the maximum time delay. This is a flexible timer that can be recycled rapidly over long periods. Furnished with two normally open, two normally closed, or one normally open and one normally closed contacts.

BULLETIN 848
FLUID DASHPOT TIMING RELAY

Here is a magnetic type timing relay that combines simplicity, dependability, and low cost. It can be used in many applications where reliability is more important than exactness of timing. Operates at ambient temperatures from +120 F to −30 F without undue variations in timing. Has an adjustable range from 2 to 20 seconds and is available for a.c. or d.c. . . . in single pole construction . . . with either normally open or normally closed contacts.

A-B Quality

ALLEN-BRADLEY

MOTOR CONTROL

Write for New Timer Bulletin

Allen-Bradley Co.,
1316 S. Second St.,
Milwaukee 4, Wis.

ment, air-operated pump may be substituted for conventional electric-motor-operated hydraulic pump where electricity is not available. This is a single-acting unit that makes one stroke of its piston each time the valve is opened. Both opening and releasing of the valve is controlled by foot pedals. The pump is available with several styles and sizes of oil reservoir.

Lyon-Raymond Corp., 3252 Madison St., Greene, N. Y.

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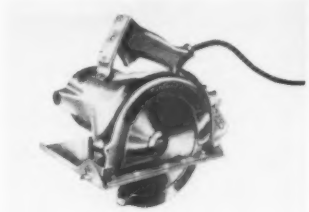

Portable Electric Saw

Six-inch portable saw, called Metalmaster Model 150, has an adjustable base to permit varying the depth of cut and beveling at any angle from zero to 45 degrees. Maximum vertical depth of cut is 2 inches, minimum, $\frac{3}{4}$ inch; at 45 degrees, maximum depth is $1\frac{1}{4}$ inches, minimum, $\frac{3}{8}$ inch.

Designed for heavy-duty service, it is powered with a universal 110-volt motor for 4000 rpm. no-load speed. Unit measures 9x6$\frac{3}{4}$x8 inches, weighs 10 pounds, 4 ounces. Blower-type fan keeps cutting line clear of sawdust. One-piece aluminum housing encloses the saw and forms the upper blade guard; a lower telescoping safety guard covers the blade except while cutting.

The Bradford Machine Tool Co., Evans & Viaduct Sts., Cincinnati 4, O.

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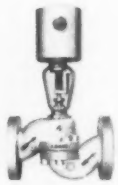


Solenoid-Operated Control Valves

Intended for use in controlling fluids at pressures up to 3000 psi., solenoid-operated electro-pneumatic valve uses a secondary pressure source, such as air, gas, or liquid, at pressures from 50 to 300 pounds through a 3-way pilot solenoid. Called the 1520 series, it is available in sizes ranging from $\frac{3}{4}$ to 3 inches.

The valves are made in carbon steel, Type 316, stainless, Durimet 20, Hastelloy B-C-D, nickel, and monel. They may be used with

Cut cost of packaging materials with ACME SILVERSTITCHER

An Acme Silverstitcher stitching metal caps to fibre tubes at the B & T Metals Company, Columbus, Ohio.

How metal company made 87% saving

When the B&T Metals Company, Columbus, Ohio, installed Silverstitchers to help package buffed and polished aluminum extruded shapes, they achieved these excellent results:

The cost of staples was cut 35 cents per thousand—over-all savings in packaging materials, 87%.

Besides this, there was a time saving of 30%, and production was increased because of the ease of operation, lower maintenance and greater efficiency of the Acme Silverstitchers. They found, too, that stronger, better-quality packaging was achieved.

An Acme Shipping Specialist helped get these results. One of these experts will be glad to analyze your packaging and shipping problems with no obligation whatever. Call the district office nearest you, or mail coupon for more information.

STITCHING WIRE DIVISION

ACME STEEL COMPANY

NEW YORK 17 ATLANTA CHICAGO 8 LOS ANGELES 11

ACME STEEL COMPANY, Dept. FM-109
2838 Archer Avenue, Chicago 8, Illinois

☐ Send booklet, *"Profit by Stitching."*
☐ Have representative call.

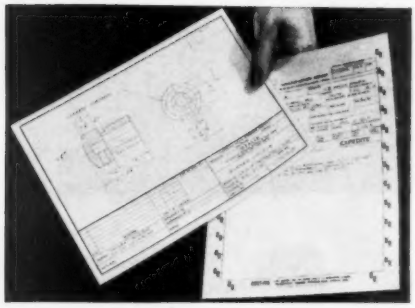
Name_____

Company_____

Address_____

City_____ Zone_____ State_____

If you copy ANYTHING typed, drawn or written, you need OZALID!



It's Simple...

Take any letter, sales report, form, drawing . . . anything typed, drawn or written.

Put it next to a sheet of any Ozalid material (paper, plastic, cloth, black, blue, red, sepia) and then feed it into an Ozalid machine.

It's Quick...

In as little as 25 *seconds*, you (anyone can operate Ozalid) will have a *dry, positive, exact* duplicate of your original material!

Ozalid copies can be used as masters to obtain more copies! No proofreading . . . no mistakes . . . no delay!

It's OZALID!

Make Ozalid copies any length, almost any width. Make them directly from translucent material, from opaque originals with an intermediate step.

Write today on your letterhead for FREE booklet which tells the full Ozalid story. Or consult your classified directory for local distributor.

Don't copy *use* **OZALID!**

Dept. 134, Johnson City, N. Y.

A Division of General Aniline & Film Corporation. *"From Research to Reality"*

liquid oxygen (—298 degrees F.), fuming nitric acid, sulphuric acid, and alcohol. Helium, nitrogen, hydrogen, and other gases at high pressures may also be handled, as well as heavy fluids which carry solids.

The Annin Co., 3234 Mines Ave., Los Angeles.

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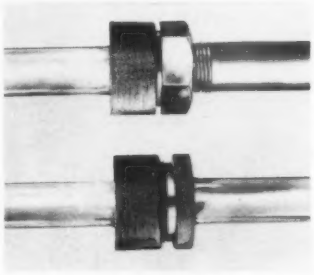

Glass-Pipe Coupling

Threaded metal coupling, for use with Pyrex glass pipe lines, is designed to replace conventional 3-bolt triangular metal flanges. No wrenches are needed for installation, and manufacturer claims that the danger of breakage due to uneven take-up is eliminated with the metal couplings. They are available in $\frac{1}{4}$-, $\frac{1}{2}$-, $\frac{3}{4}$-, and 1-in. sizes for making glass-to-glass or glass-to-metal connections.

Fisher & Porter Co., Hatboro, Pa.

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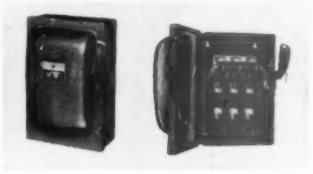


Safety Switches

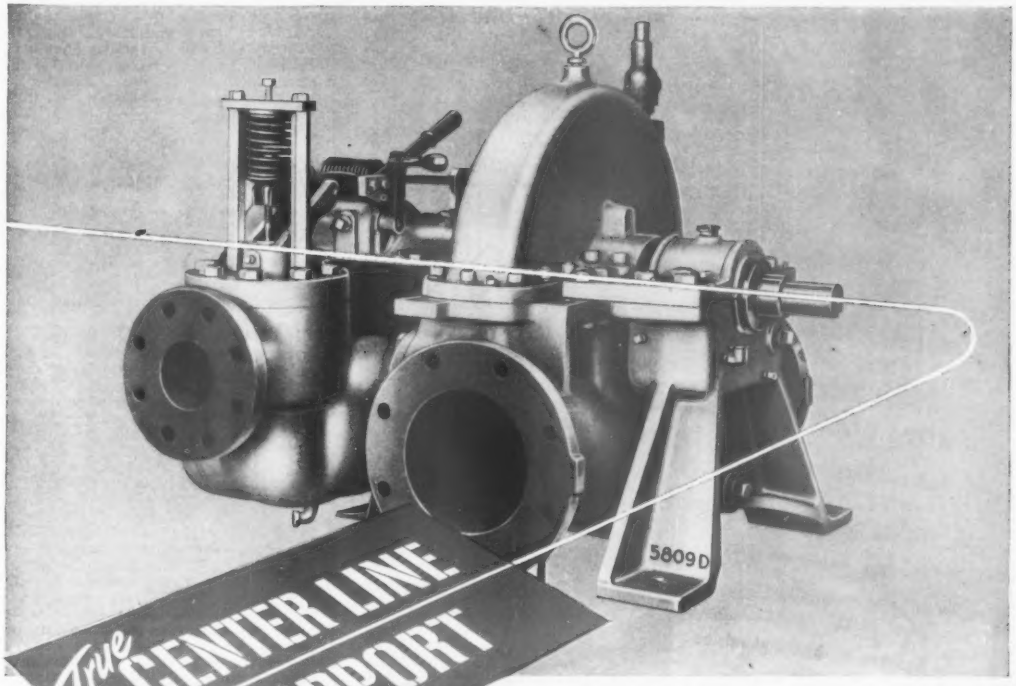
Safety switches for heavy, standard, and general-purpose duty are available in 30- and 60-amp sizes. Current carrying parts are silver plated, and blades are visible for checking operation. Line terminals are dead front, protected by hinged arc chamber cover. Jaws and fuse clips are steel reinforced to exert positive pressure. Pressure connectors are removable, so solder lugs may be used where preferred.

Square D Co., 6060 Rivard St., Detroit 11.

•

Gear Coupling

Made of forged high-carbon steel, with internal teeth running the full



assures perfect alignment with the driven machine...

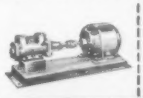
Thermal expansion can't throw a De Laval CA Turbine out of line with the driven machine. The body of the turbine is supported at the *exact* center line to allow for radial expansion. The front end is mounted on a flexible channel to allow for axial expansion. Thus, both radial and axial expansion can take place under extreme temperatures without disturbing the shaft center line.

This is but one of the many features that assure trouble-free operation with the new De Laval Class CA Turbine under all operating conditions with initial steam conditions up to 600 psi, 750 F.

Before you buy a turbine, be sure and get complete information on these additional De Laval features:

1. A choice of eight governors.
2. Balanced double-seated bonnet-type governor valves for close control of steam flow.
3. *Positive* over-speed protection entirely separate from normal speed governor for unfailing emergency shut-off.
4. Sensitive, friction-free, wear-resistant "rocking chair" governor pivots.
5. Super-smooth, chrome plated shaft journals to make carbon rings last longer.
6. The casing and bearings split horizontally at center line for easy removal and inspection of the rotor, carbon rings and bearings.

SEND FOR CATALOG 4202-23-J



DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

DE LAVAL

T-23

No Trick at all!
AVOID SLIPPING ACCIDENTS
with
Oil-Dri
ABSORBENTS
CHECK THESE ADVANTAGES
1. Reduces slipping hazards
2. Reduces fire hazards
3. Improves floor conditions
4. Reduces maintenance labor costs
5. Reduces insurance penalties
6. Improves working conditions
7. Permits safer, easier, faster walking on plant floors
8. Improves plant housekeeping
Absorbs all types of Oils, Greases and Fats plus Water and Soluble Solutions from Floors.
EASY TO USE...
Just put it on grease spots
ECONOMICAL...
Saves time—Saves labor
Ideal for:
• Factories • Garages
• Machine Shops
• Repair Departments
• Power Plants • Kitchens and Food Plants
• Elevator Pits
DONT PUT IT OFF--
PUT IT ON!
Manufactured Exclusively by
Oil-Dri Corporation OF AMERICA
520 N. MICHIGAN AVE. CHICAGO 11, ILLINOIS

working length, gear coupling has reinforced neoprene seal. Hub teeth are cut radially to reduce backlash. Made in ¾-, 1-, 1½-, 2-, and 2½-in. sizes.

Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J.

•

Finishing Cement

Finishing cement, called Powerhouse, a dry, loose material of mineral wool fiber base, is said to have a thermal efficiency superior to that of asbestos finishing cements, and approaching that of insulating cements. It may be applied by trowel over any thermal insulating block or plastic insulating cements without need for wire reinforcement. It is claimed to have low shrinkage and to resist temperatures up to 1700 degrees F.

Suitable for indoor or outdoor applications on equipment such as boilers, breechings, ductwork, vulcanizers, kilns, and turbines, it is adaptable to irregular small surfaces and large flat areas in either thin or thick layers.

Baldwin-Hill Co., 500 Breunig Ave., Trenton 2, N. J.

•

Foot Switch With Protecting Boot

Protection against accidental operation is provided on heavy-duty Type MB foot switch by a cast metal boot which extends on both sides and over the top of the actuating foot treadle. Case measures 8x5x5¼ inches, is provided with mounting holes.

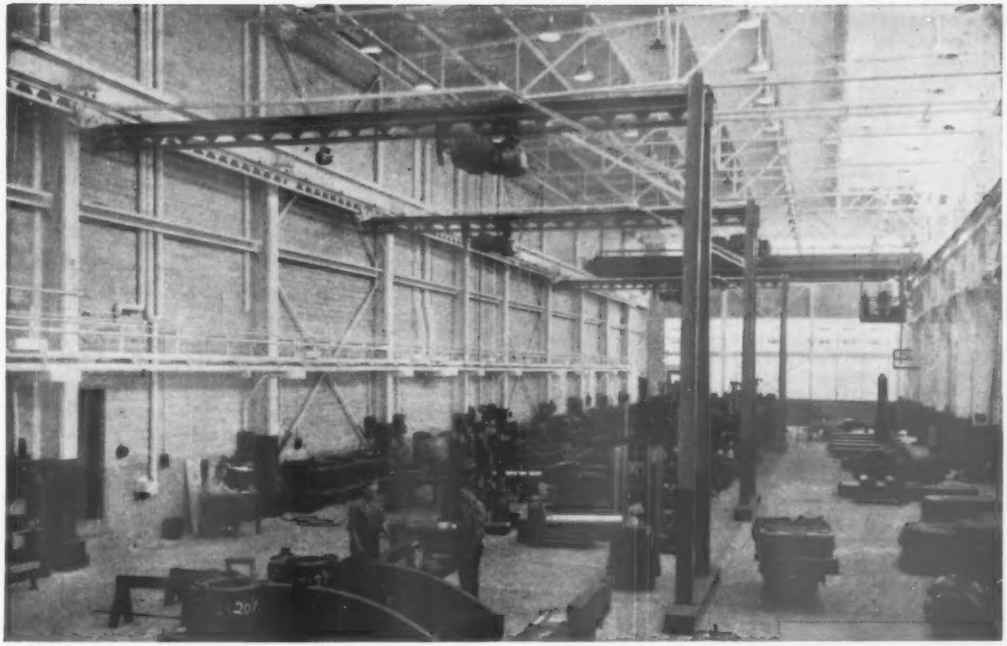
Switch can be furnished in normally open, normally closed, or double-throw spring return; alternate contact operation, either single- or double-throw; and 2-stage double-pole single-throw.

General Control Co., 1200 Soldiers Field Rd., Boston.

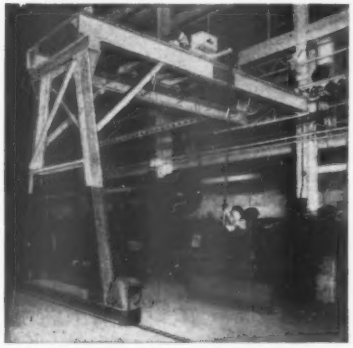
•

Relief Valve for Boilers

Discharge capacity of relief valve for hot water heating boilers is 242,900 Btu. per hour. Manufacturer states that when the set pressure of 30 pounds has been reached, the needle lifts just far enough to discharge water at the low rate necessary to take care of the thermal ex-



Single bridge, hand-propelled gantries with electric hoists operating under heavy overhead crane in a machine tool plant.



Double girder, completely motorized gantry. Because gantries ride on a floor rail and one wall rail, their use often eliminates need of long span overhead cranes.

GANTRY CRANES BOOST PRODUCTION

IT is not unusual for skilled workers to wait 5 or 10 minutes and more in many shops for crane service. By providing a sufficient number of gantry cranes, much or all of this lost time can be eliminated and production aided.

Efficiency usually can be greatly improved by providing one large overhead crane for each shop bay — for the heavy lifting and transportation from one end of bay to the other — and a number of gantries to work under it, to do the light local or spot handling.

Several Cleveland Tramrail gantries generally can be purchased for the price of a large overhead crane and are available for manual or electric operation.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3209 EAST 284th STREET, WICKLIFFE, OHIO

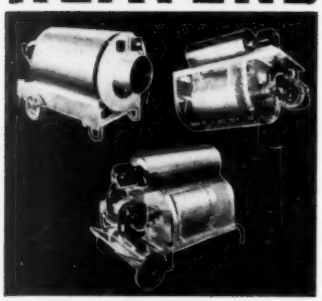
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

LOW COST HEAT

...at the flick of a switch!

Low initial cost, low upkeep, low operating cost . . . *plus* efficient space or spot heating . . . where you want it, when you want it. Eight models meet every industrial need . . . radiant or forced air . . . 170,000 to 800,000 B.T.U. per hour . . . manual or fully automatic operation . . . sturdy, light weight. Safe . . . no matches or open torch . . . just flick the switch! No carbon monoxide or unburned hydrocarbon.

new SILENT GLOW HEATERS PORTABLE



Typical Uses

FOR HEATING IN WAREHOUSES • GARAGES
FOUNDRIES • HANGARS
NEW CONSTRUCTION • PLASTER
CONCRETE • FROZEN PIPES OR GROUND
PRE-HEATING FREIGHT CARS • MACHINERY
EMERGENCY HEATING, ETC.

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THE SILENT GLOW OIL BURNER CORP.
863 Windsor Street, Hartford 5, Connecticut

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Firm _____

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City _____ State _____

SSH49

pansion of water. If for any reason temperature rises into emergency zone, increased velocity acts on a "hydralift" ring, increasing lifting power and snapping the valve open to dissipate the heat.

McDonnel & Miller, Inc., Wrigley Bldg., Chicago 8.

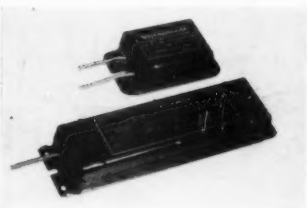
•

Plate Clamp

Measuring 9x12 inches, steel plate clamp, Marco-clamp, is intended for handling ¼- to 2-in. plate. Weight of plate determines strength of grip. It is made of flame-cut and welded alloy steel, with hardened gripping teeth. Wire rope is supplied for attachment to hoist or crane.

The Marbott Weld Co., 4389 Martin Ave., Cleveland 5.

•



Fluorescent Lamp Ballast

Designed to match the characteristics of the 35-in. T-12 fluorescent lamp, 25-watt lamp ballast is made in two sizes. It can be used with either single or two-lamp luminaires.

The single ballast is rated at 110-125 volts, 0.52 amperes; the 2-lamp size, 1.04 amperes. Both operate at approximately 55 per cent power factor.

Westinghouse Electric Corp., Box 868, Pittsburgh 30.

•

Protective Case for Thermostats

Stainless-steel case, called Thermowell, is designed to protect manufacturer's thermostats from excessive pressures, physical blows, or other external forces, including attack by corrosive liquids or atmospheres. It

THERE'S A *Cambridge* WIRE BELT to combine movement with processing

for EVERY PRODUCT or MATERIAL

Bagged cement is sped on its way from the packaging machine with a minimum of handling on a Cambridge Interwoven Belt — a belt offering low ultimate cost, high tensile strength, resistance to distorting strains. In this photo, open mesh permits sifting of loose material for cleanliness.

Whether your product is big and bulky or small and fragile, if it must move during processing or production, a Cambridge Woven Wire Conveyor Belt can do the job.

Woven from any metal or alloy to any mesh or weave, Cambridge belts offer dependability, long life, freedom from time-wasting shutdowns for repairs. Among the specially designed Cambridge belts in service today are continuous conveyorized installations for baking, quenching, tempering, washing, drying, cooling and packaging.

Whenever you have a problem concerning movement during processing, call in a Cambridge Field Engineer.

Or, for complete information on the entire Cambridge line, write today for your FREE copy of this 130 page illustrated book. Gives belt and conveyor design, applications, installation data, construction details. Write today!

There's a Cambridge Sales Engineering Office Near You.

Cambridge Wire Cloth Co.
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Wire cloth in rolls. | Also specialized wire fabrications

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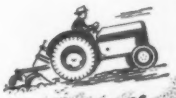
PLENTY TOUGH when the going's ROUGH!



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CRANES • POWER SHOVELS

TRUCKS AND CARS

ROAD BUILDING MACHINERY

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RAILROAD EQUIPMENT

LAMSON "1035" CAP SCREWS

Toughness . . . Strength . . . Precision

Accurately headed, precision threaded and *plenty rugged*—
that, in a nutshell, describes Lamson "1035" Cap Screws.

Lamson pioneered the "high tensile" Cap Screw after years of research
and "on the job" testing.

Today's "1035" product is precision-made on the finest type of bolt-making
machinery—and heat-treated automatically in furnaces
where the atmosphere is scientifically controlled.

As a result, the modern Lamson "1035" Cap Screw is unmatched
for strength, toughness and all-round quality.

That's why you'll be way ahead always to say "Lamson" *before* you say "Cap Screws."

THE LAMSON & SESSIONS COMPANY

General Offices: 1971 West 85th Street, Cleveland 2, Ohio

Plants at Cleveland and Kent, Ohio • Birmingham • Chicago

Lamson & Sessions

"One Dependable Source for All Fastener Needs"

SEMS	LOCK NUTS	NUTS	STUDS
STOVE BOLTS	LAG BOLTS	WASHERS	RIVETS
TAPPING SCREWS	ROPE CLIPS	SET SCREWS	PLOW BOLTS
"1035" CAP SCREWS	MACHINE BOLTS	CARRIAGE BOLTS	COTTER PINS

CUT ALONG THIS LINE

WANT MORE INFORMATION on any of these fasteners? CHECK—and CLIP this strip.

LAMSON LOCK NUTS: Economical, vibration-proof. Can be re-used repeatedly.

"1035" SET SCREWS: Cup point type, hardened, heat-treated.

COTTER PINS: Steel, Brass, Aluminum and Stainless Steel.

SPECIAL NUTS: Cone, Barrel, Oblong, Plier, Tri-Slot, Half-round, etc.

PHILLIPS AND CLUTCH HEAD: Machine Screws and Tapping Screws.

MILLED STUDS: Concentric, accurate, in a full range of sizes.

"BENT" BOLTS: Including U Bolts, Eye Bolts, Hook Bolts, etc.

WEATHER-TIGHT BOLTS: Eliminate counter-boring in wood assemblies.

PIPE PLUGS: Forged Steel, heat-treated.

The Lamson & Sessions Company
1971 W. 85th St., Cleveland 2, Ohio

NAME

POSITION

COMPANY

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CITY ZONE STATE

OUT OUR WAY

OUR PRODUCT GLOWS IN THE DARK! IT'S SENSATIONAL!
YOU GUYS ARE WASTIN' YOUR TIME! I USE SOL-SPEEDI-DRI BECAUSE IT COVERS MORE, ABSORBS MORE, COSTS LESS TO USE!
THE PRODUCT I SELL CRACKLES AND POPS--KEEPS EVERYBODY ON THE JOB WIDE AWAKE!
"GLOWS IN THE DARK--CRACKLES AND POPS!" THEY'VE GOT TO HAVE SOMETHING TO SAY--'CAUSE THEY CAN'T MATCH THE NEW IMPROVED SOL-SPEEDI-DRI!
YEH, CLAIMS NEVER DID DO SO GOOD AGAINST FACTS! AND THE OL' MAN'S GOT THE FACTS ABOUT SOL-SPEEDI-DRI!
HIGH PRESSURE
J.R.WILLIAMS

You Can't Beat the Facts!

New improved *SOL-SPEEDI-DRI* gives you *more volume* per pound.

New improved *SOL-SPEEDI-DRI* *covers more* floor area per pound.

New improved *SOL-SPEEDI-DRI* *absorbs more* liquids per pound.

YES, the new improved Sol-Speedi-Dri is more economical to use, because you get more bulk, more coverage, more absorption per pound.

★

Safety & Maintenance Co., Inc., 1 Wall Street, New York 5, N.Y.

Warehouse stocks maintained in principal cities of the United States and Canada.

also protects against ambient effects which might influence the thermostat's functioning when the head protrudes from the medium being controlled. Six basic types are available in standard and heavy-duty models.

Fenwall, Inc. Ashland, Mass.

•

Heavy-Duty Floor Machine

All-purpose floor machine, "Johnson's Wax Super 16," is made to handle any type of floor maintenance, according to maker. A variety of accessories are available for polishing and scrubbing, sanding, grinding, using steel wool, and waxing. With solution tank and shampoo brush, it also washes rugs. It is powered by a $\frac{3}{4}$-hp. motor in a heavy aluminum casting.

S. C. Johnson & Son, Inc., Carnu St., Racine, Wis.

•

Wiring Device

Called the Sta-Kon Disconnect, "wristlock" device consists of two identical joining parts, permitting the similar ends to be meshed and locked together by hand. Manufacturer claims that it cannot become unfastened in line of pull, or swivel out of connection.

Featuring a brazed barrel and an insulation grip, device makes a positive electrical connection, and may be used with relays, signal or elevator equipment, fractional-horsepower motors, or other equipment that requires frequent connecting or disconnecting.

The Thomas & Betts Co., Elizabeth, N. J.

•

Roof Ventilator

Round stationary ventilator, known as the Valvent, is made in five throat sizes, ranging from 12 to 36 inches. Combination damper and inverted cone air guide is said to

See what you can do with your present equipment...

... AND

Kodagraph Autopositive Paper

You can produce positive photographic copies directly from all types of originals —without a negative step, without darkroom handling. Simply expose this revolutionary new paper in your direct-process or blueprint machine . . . develop in standard photographic solutions. You'll get sharp, reproducible "masters" . . . with dense, ink-like lines on a durable, evenly translucent base. Intermediates . . . that are of original quality, or better . . . that produce sharp, clear blueprints and direct-process prints at uniform, practical machine speeds . . . that are photo-lasting in the files.

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Kodagraph Contact Paper
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Kodagraph Contact Paper assures improved results, lowers production costs with any type of contact photocopier. It reproduces your office work or drawings in dense photographic blacks, brilliant whites . . . on a non-curling, high-quality paper base. *Kodagraph Contact Cloth* gives you reproductions of maximum durability. Its highly translucent white base assures fast, even printing in the production of blueprints or direct-process prints.

THE BIG NEW PLUS

Kodagraph Reproduction Materials

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Kodagraph Projection Papers
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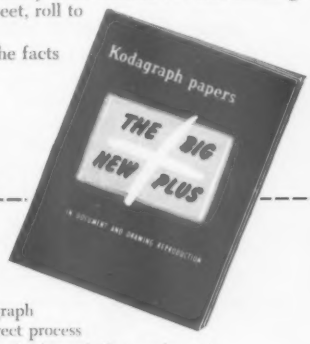
Here's versatility you'll appreciate when making change-of-scale prints in your enlarger, process camera, or projection printer. You can use *Kodagraph Projection Paper* . . . which allows plentiful safelight illumination, ample time for dodging. Or *Kodagraph Fast Projection Paper*, which gives you maximum printing speed. When intermediates of maximum durability are desired, you can get them by using *Kodagraph Projection Cloth*, which has the same physical characteristics as Kodagraph Contact Cloth.

EASTMAN KODAK COMPANY
Industrial Photographic Division
Rochester 4, N. Y.

You can do more...

as you can see, simply by using Kodagraph Reproduction Materials in your present reproduction equipment. You'll find, too, that production is easier, surer . . . more economical than ever before . . . because these new photographic papers and cloths have extremely wide latitude . . . and amazing uniformity—from sheet to sheet, roll to roll, package to package.

It will pay you to get all the facts —soon!



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Please send me a copy of "The Big New Plus"—your booklet about Kodagraph Reproduction Materials. I have ☐ direct process ☐ blueprint ☐ contact printing ☐ projection printing equipment.

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Kodak
TRADE-MARK

Only $2.98 helps put new "sell" in television advertising

Sponsor of television show had to refilm his commercials to meet a new selling problem. New films picked up at studio 4 P.M., delivered to TV station 800 miles away 8:47 P.M. same evening. Air Express cost for 11-lb. carton, $2.98. (In *undramatic* fashion Air Express keeps radio, television or any business rolling.)

Remember, $2.98 bought a complete service in Air Express. Rates include door-to-door service and receipt for shipment—plus the speed of the *world's fastest* shipping service.

Every Scheduled Airline carries Air Express. Frequent service—air speeds up to 5 miles a minute! Direct by air to 1300 cities; fastest air-rail to 22,000 off-airline offices. Use it regularly!

Only Air Express gives you all these advantages

Nationwide pick-up and delivery *at no extra cost* in principal towns, cities.

One-carrier responsibility *all the way;* valuation coverage up to $50 without extra charge. And shipments always *keep moving.*

Most experience. More than 25 million shipments handled by Air Express.

Direct by air to 1300 cities, air-rail to 22,000 off-airline offices.

These advantages make Air Express your best air shipping buy. Specify and use it regularly. For fastest shipping action phone Air Express Division, Railway Express Agency. (Many low commodity rates in effect. Investigate.)

SPECIFY AIR EXPRESS
AIR EXPRESS GETS THERE FIRST

Rates include special pick-up and delivery door to door in principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE
SCHEDULED AIRLINES OF THE U.S.

direct outgoing air and to permit varying the degree of opening, from wide open to completely closed.

Standard construction is of galvanized steel, but it is also available in other metals to meet special conditions. It is made both as a gravity ventilator and as a powered unit, the latter in capacities ranging from 630 to 25,700 cfm., depending on the combinations of motors, fans, and throat sizes.

The Swartwout Co., 18511 Euclid Ave., Cleveland 12.

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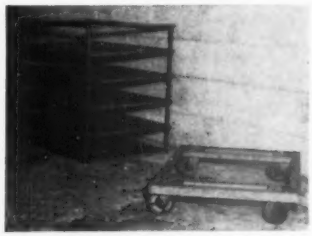


Nesting-Tray-Dolly Combination

Combination of all-steel welded tiering trays and castered dolly was developed to speed transfer from one process to another, or from machine to trucks. Dolly measures 32x21x5⅛ inches, is equipped with four 4-in. swivel casters. Individual tiering trays, with perforated sheet bottoms, open sides, and rounded corners, will tier 10 to 12 trays or higher.

Coneco Engineering Co., 17616 Waterloo Rd., Cleveland 19.

•

Counting Device

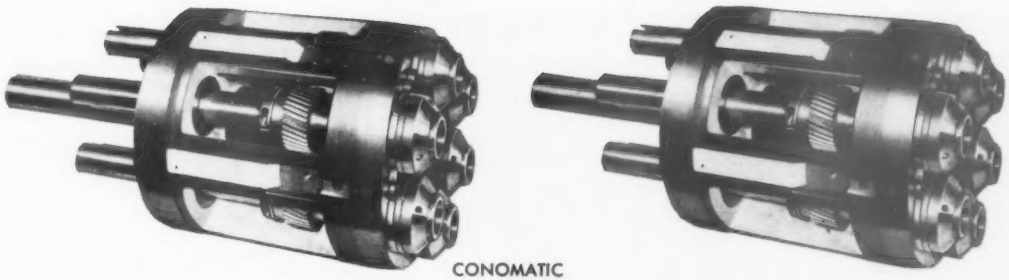
Counter, called Duo-Cam, was developed for such uses as size-grading, counting graded pieces, and similar operations. It is made both as a revolution-ratchet counter, which adds one count for each revolution of the drive shaft in either direction, and as a ratchet-with-stops counter. The latter adds one count for each oscillation of the lever through an angle of 30 degrees. Maximum speed of the former type is 200 counts per minute; of the latter, 500 counts. Device may be reset by clock key.

Veeder-Root, Inc., 25 Sargeant St., Hartford 2, Conn.

•

Cold-Weather Ballast

Instant-start 40-watt Tulamp ballast has been designed for operation in temperatures as low as —20 degrees F. Manufacturer states that this is made possible by the use of a low-temperature capacitor, to-



CONOMATIC
1½" 6-Spindle
CARRIER

CARRIER FRAME INFORMATION		CARRIER FRAME INFORMATION
Rugged	ARE YOU	1. One piece — 615 pounds 2. Nickel Moly Iron (normalized) 3. Overall Length — 20" 4. Bearing Length — 5.04" 5. Bearing Area — 306.6 sq. in. (Full information available)

SUBJECT TO WITHHOLDING?

The withholding of information regarding the facilities of machine tools would be unintentional. But the use of generalizations and approximations, instead of specifications, actually is withholding. Generalizations fail to establish the superiority of a machine's facility through terms which lack a definite basis of comparison. They leave an impression of doubt as to tangible substantiation.

There is nothing definite about a "roomy" tooling area; nothing specific about a "rugged" tool slide, and nothing comparative about a "massive" frame.

The dispensing of machine information is the responsibility of the manufacturer. Realizing this, CONE has prepared an analysis chart that should prove very useful to those seeking more specific information about multiple spindle automatic bar machines. Your copy is free. There is no obligation.

A comparison with ALL Automatics
will lead you to

Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Smooth Action and Ruggedness that PAY Dividends in Any Doorway

KINNEAR STEEL ROLLING DOORS

Above installation shows how hood of Kinnear Rolling Door can be mounted on building exterior where desired. May also be concealed above lintel or mounted on inside wall.

You save in at least three ways when you equip service openings with Kinnear Steel Rolling Doors. First, their smooth, easy, coiling upward action gives you full use of all surrounding floor and wall space. Materials of any kind can be stored within an inch or two of the doors, inside or out, without impeding their operation. They open completely out of the way of traffic, coiling compactly out of wind's reach.

Second, Kinnear's neat, strong curtain of interlocking steel slats assures long, dependable, low-maintenance service. Upkeep costs are negligible. Third, the all-metal construction of Kinnear Rolling Doors gives you extra protection against fire, intruders, wind and storm damage, and other hazards.

Years of actual use in hundreds of buildings prove the economy and high efficiency of Kinnear Rolling Doors. Motor or manual control. Easily installed in old or new buildings. Any size. Write for details today!

THE KINNEAR MANUFACTURING CO.

Factories

1540-60 Fields Ave., Columbus 16, Ohio—1742 Yosemite Ave., San Francisco 24, Cal.

Offices and Agents in Principal Cities

SAVING WAYS IN DOORWAYS KINNEAR ROLLING DOORS

gether with special internal construction. It is made in a standard brick cross-section.

General Electric Co., Specialty Transformer & Ballast Divs., Schenectady 5, N. Y.

•

Power Belt Conveyor Section

Called Power Helper, conveyor section is made in either 12- or 16-in. widths of belt, and boom lengths of 10 and 15 feet. Elevating belt has a rough top surface of neoprene. Unit is made with five rollers in an adjustable head section, and ball-bearing thrust on both vertical and elevating adjustments.

Features include a ¾-hp. reversing motor, drum switch control, 110 volts, 60-cycle a.c. Base is carried on 8-in. load and 6-in. swivel ball-bearing wheels.

Metzger Co., 438 Douglas St., N. W., Grand Rapids, Mich.

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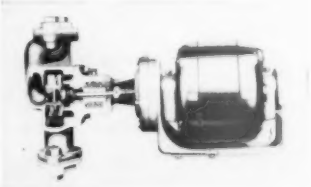


Water Circulator

For use with radiant heating systems, horizontal circulator is constructed with a rotating body for different pumping positions. Other features include porous bronze Oilite bearing, rotary seals, spring drive coupling, stainless steel shaft, balanced cast bronze impeller, and two bolt flanges. Device is made in 1-, 1¼-, and 1½-in. sizes; the 1-in. model is available with ¾-in. flanges.

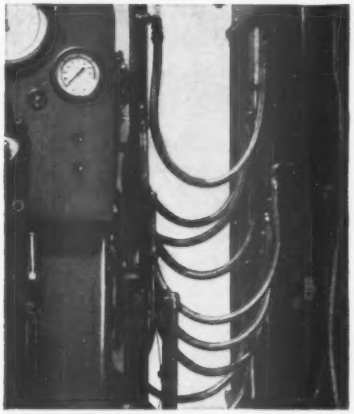
Taco Heaters, Inc., 137 South St., Providence, R. I.

•

Portable Air Compressors

Dual-pressure piston-type portable air compressors are designed to provide two working pressures and two

make it **flexible** and pressureproof



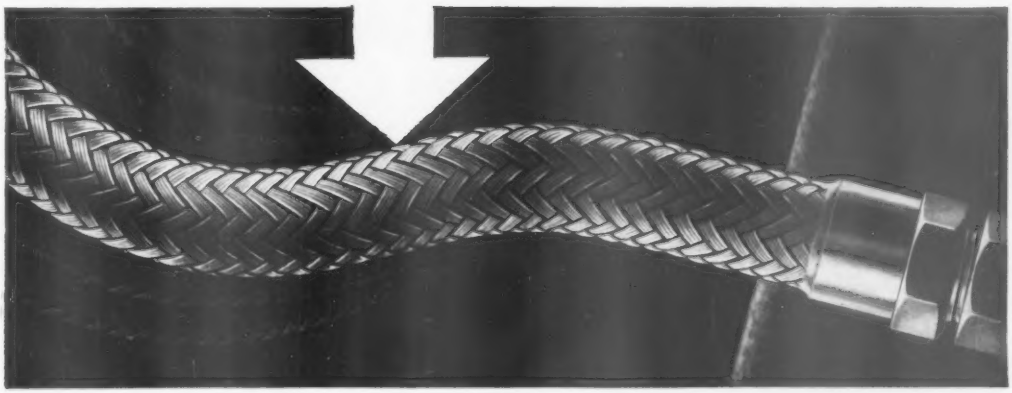
Steam to the moving platens of this hot plate press, made by Williams, White & Co., of Moline, Ill., is carried through these ½" I. D. Bronze American Seamless Flexible Metal Connectors.

Are you plagued with piping that must move, that vibrates, or has connections that are out of alignment?

Whether it carries fluids, gases, semisolids or steam, there's a type of American *Seamless* Flexible Metal Tubing or Flexible Metal Hose to do the job. Neither heat, pressure nor corrosion presents a problem.

American Seamless Flexible Tubing is made of seamless corrugated tubes of bronze and other workable metals, in standard sizes from ⅛" up. They are reinforced with one, two or three pressure-resistant coverings of wire braid. American Flexible Metal Hose is made of spirally wound continuous strips of brass, bronze, aluminum, steel and other metals in ⅛" to 12" I. D. sizes.

For illustrated literature, or the help of our Technical Department, just address The American Brass Company, American Metal Hose Branch, Waterbury 88, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.



wherever connectors must **move**

ANACONDA
from mine to consumer

American

FLEXIBLE METAL HOSE AND TUBING

*LOOK for

big reductions in costs where opportunities for substantial

SAVINGS

are greatest . . . in the incredibly rich field of materials handling.

For the quick, sure way to achieve them,

*LOOK to the fast, sturdy, low-cost machines produced by

CLARK

How several foremost industries have "looked to Clark" —with quick and substantial profit to themselves— is described and illustrated in Material Handling News and in Clark's exceedingly helpful motion pictures. You can enjoy the benefits of these by requesting them on your business letterhead.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 12, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

air deliveries. A lever converts the unit from 150 pounds pressure delivering 2.4 cfm. free air, for operations requiring high pressure, to a continuous-running unit at 50 pounds pressure delivering 3.2 cfm., for applications requiring low pressure and increased volume.

Model G-140-DS is powered with a ¾-hp. gasoline engine; Model B-140-DS, mounted on a portable 2-wheeled rubber-tired cart, uses a ½-hp. electric motor.

American Brake Shoe Co., Kellogg Division, 97 Humbolt St., Rochester 9, N. Y.

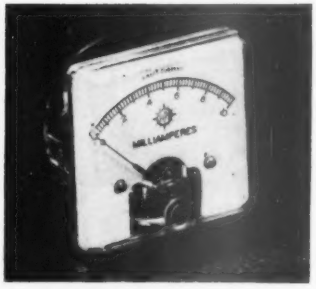
•

Barrel Truck

Heavy-duty one-man barrel truck is designed to handle wood barrels or steel drums weighing up to 1000 pounds. Wheels are 10 inches in diameter with molded-on rubber tires and Hyatt roller bearings. Frame is double-center-column type, made of heavy structural angles and center posts. Handles are 1 5/16-in. steel tubing, with rubber-covered hand grips. Chime hook is adjustable to permit handling any height of drum or barrel.

Buffalo Caster & Wheel Corp., 159 Breckenridge St., Buffalo 13, N. Y.

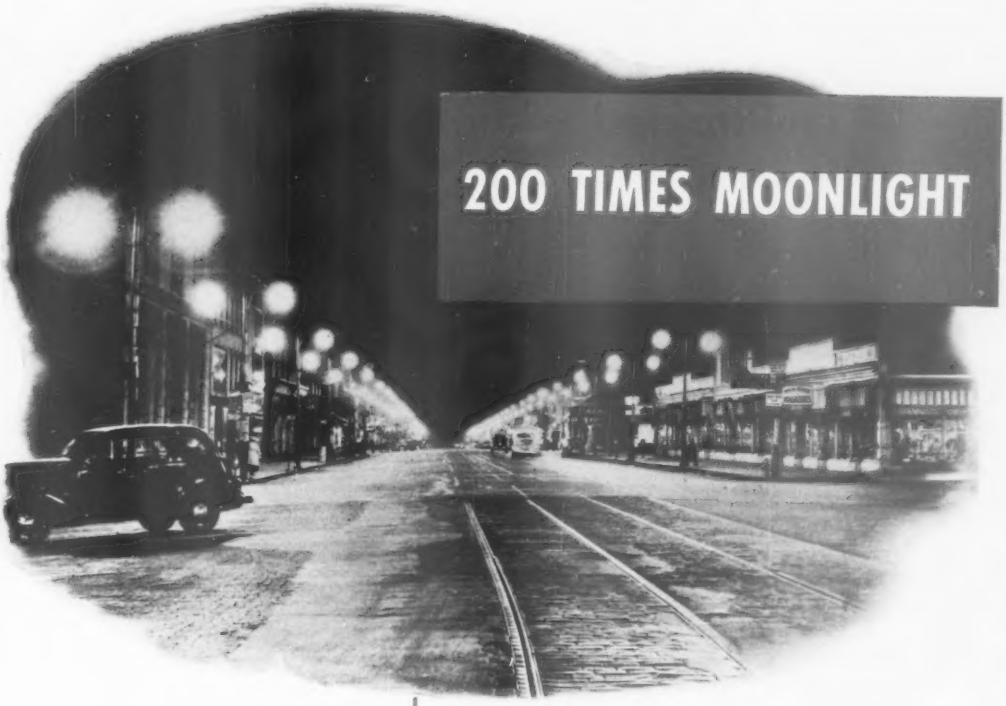
•

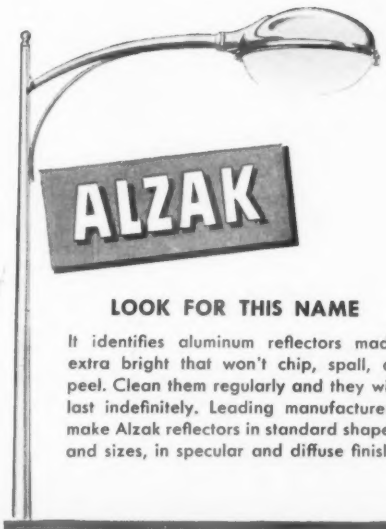


Panel Meter

Transparent case of 2½-in. panel meter is molded of heat-resistant plastic that is shatterproof and casts no shadows on the dial. The front measures 2 7/16x2 5/8 inches. Four mounting studs are located on 1 7/8 centers, and the barrel diameter is 2 7/32 inches.

Meter is available in a variety of ranges from 20 microamperes to 50 amperes, and 5 millivolts to 500





LOOK FOR THIS NAME

It identifies aluminum reflectors made extra bright that won't chip, spall, or peel. Clean them regularly and they will last indefinitely. Leading manufacturers make Alzak reflectors in standard shapes and sizes, in specular and diffuse finish.

Over five foot-candles flood Falls Street in Niagara Falls, New York. That's a brilliance 200 times average moonlight. General Electric luminaires with Alzak reflectors make this street one of the world's brightest. Yet there's a note of economy here. Alzak reflectors are efficient . . . have long life . . . save lighting dollars.

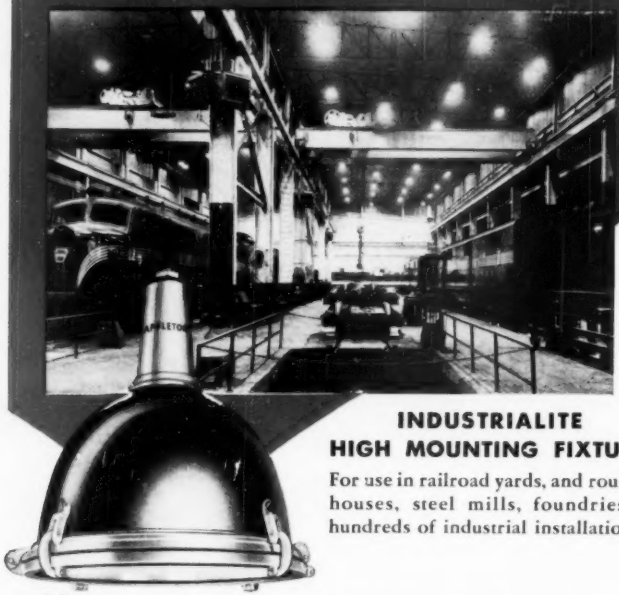
Think of your lighting. Big money goes into wire, fixtures and current. Why waste that investment with poor reflectors, when Alzak reflectors give high lighting efficiency. ALUMINUM COMPANY OF AMERICA, 1941K Gulf Building, Pittsburgh 19, Pennsylvania.

ALZAK REFLECTORS
OF ALCOA ALUMINUM

ALCOA

made by Leading Lighting manufacturers

MAIN LINE SCHEDULES
maintained with
APPLETON LIGHTING



INDUSTRIALITE
HIGH MOUNTING FIXTURE

For use in railroad yards, and roundhouses, steel mills, foundries—hundreds of industrial installations.

Here's the Appleton Industrialite High Mounting Fixture in use in the Harrisburg, Pa., Diesel-Electric Locomotive Shop of The Pennsylvania Railroad, world-famous leader in American transportation. In transportation service centers, as in countless more industrial fields, Appleton Lighting Equipment provides the basis of profitable production.

A typical example of Appleton specialized design, the Industrialite High Mounting Fixture is ruggedly constructed to deliver top performance under the most severe conditions. This fixture carries a special flange on its cast aluminum hood that eliminates the possibility of the reflector jarring loose and falling to the ground. The unit is furnished with a heat and impact resisting glass lens in a vapor and dust-tight cover assembly.

The complete Appleton line of lighting equipment includes a type and size fixture for virtually every industrial requirement—indoors or out. Each Appleton Fixture is designed to permit easy installation, easy wiring, convenient servicing.

For the finest industrial lighting equipment, specify Appleton—STANDARD FOR BETTER LIGHTING.

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1715 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices and Resident Representatives in All Principal Markets

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES
EXPLOSION-PROOF FITTINGS • REELITES

volts, all self-contained. Higher ranges, with external shunts or multipliers, rectifier-type a.c. ranges, and r.f. types may also be obtained.

Assembly Products, Inc., Main & Bell Sts., Chagrin Falls, O.

•

Self-Propelled Arc Welder

Designed for field use, self-propelled arc welder is available in two models, the GR-301-M with a 300-amp. welder for light to heavy requirements, and the GR-401-M with a 400-amp. welder for medium to extra-heavy duty. Either can be furnished with 1- or 3-kw. auxiliary d.c. power for supplying lights and universal power tools.

Called Weldmobile, device is equipped to roll under its own power and make on-the-spot repairs with arc welding, oxy-acetylene welding and cutting, and power tools. Universal coupler on the rear permits towing of additional trailer-mounted equipment.

Hobart Bros. Co., 389, Troy, O.

•

High-Speed Foot Switch

Designed for light pressure actuation at high speed, Type MX foot switch, housed in a cast-iron base with two mounting holes, measures $4\frac{1}{2}$x$1\frac{1}{4}$x4 inches. "Toe-tip" treadle requires only a $\frac{3}{8}$-in. throw.

Switch handles 10 amperes at 125 volts a.c. Contact arrangements include SPST normally open, SPST normally closed, and SPDT.

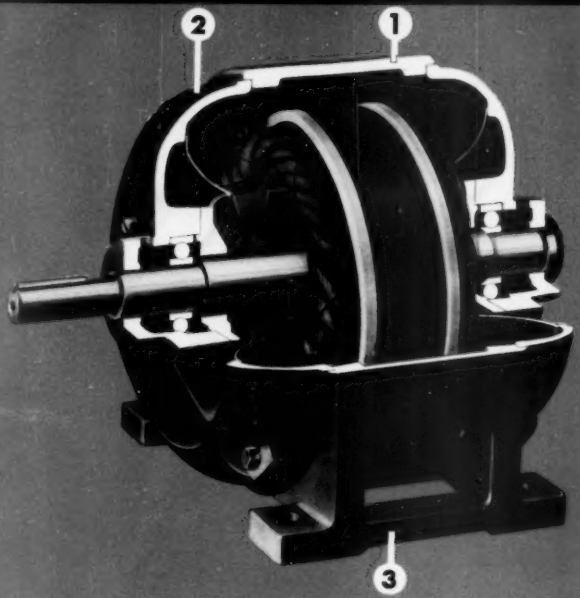
General Control Co., 1200 Soldiers Field Rd., Boston 34.

•

Liquid Leak Detector

For use in hydraulic and closed liquid systems, red liquid leak detector, called Trace, is available in a high-grade lubricating oil medium for use in systems containing oil or similar fluids, and in modified forms

YOU CAN TRUST
A TRI CLAD MOTOR
TO TAKE ABUSE
GENERAL ELECTRIC
Here's
Why...



Notice the thick cross sections of a Tri-Clad's husky cast-iron stator frame (1) and end shields (2) . . . the integrally cast feet (3). Here you have a *rigid structural unity* that no other general purpose motor we've seen can match. Distortion of bearing alignment is well nigh impossible, even by severe blows, careless installation, or the heavy continuous radial loads some industrial drives impose. Notice, too, how Tri-Clad double-end ventilation provides *uniform* "air conditioning" throughout the motor.

You can trust a TRI CLAD motor to take abuse

Teeth-rattling blows – accidental jarring – dripping liquids – they're all in a day's work for a Tri-Clad motor – the toughest general-purpose motor that hard-headed plant management can buy.

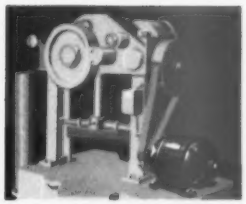
The cast iron structure which today protects more than a million and a half Tri-Clad motors, is one big reason for its stamina. It absorbs the shock of accidental blows and falling objects encountered in rigorous industrial service. It provides vastly superior resistance to rust and corrosion. Moreover, cast iron won't take on an injurious permanent "set"; thus it assures accurate shaft alignment and a permanent air-gap for the life of the motor. Thick-ribbed cast-iron end shields, too, take more than their share of punishment.

Want to standardize on a line of motors that can really **TAKE ABUSE?** Local stocks of Tri-Clad motors in your area mean **QUICK DELIVERY.** *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

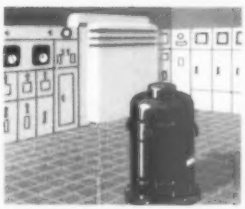
760-11

YOU CAN'T BEAT TRI CLAD EXTRA PROTECTION



G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.

G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



G-E vertical induction motors for pump drive, in streamline design. From 1 to 500 hp.

G-E capacitor motors for use on fans, blowers, pumps and compressors, with single-phase power. From ¾ to 5 hp.

Look for this **EXTRA** on the motor you buy!

for systems employing aqueous liquids and chemicals of other types. It may be used in brake assemblies, aircraft hydraulic controls, refrigerating units, and in other similar applications.

The presence of leaks is shown by a deposit of red film at the point of leakage. This permits repair of small leaks before they become serious, saves time in locating them, and reduces loss of fluid.

Highside Chemicals Co., 10 Colfax Ave., Clifton, N. J.

•

Electronic Pyrometer Controller

Designed for use where precise control is needed or where conditions of severe vibration, dust, or fumes exist, electronic pyrometer controller is suitable for medium and high temperature applications. A thermocouple sensitive element is used. Measuring circuit is a null balance potentiometer with automatic cold junction compensation. Thirteen standard measuring ranges are available. Case may be wall or flush panel mounted.

Loudon Instruments, Inc., 5644 Lake Park Ave., Chicago.

•

Automatic Locknut

Designed for positive locking, exact adjustment, and speed of application, locknut consists of a standard steel nut with a slightly elliptical retainer ring, combined in a single unit. When the locknut is applied, bolt forces the retainer ring back into circular shape, causing it to grip the bolt threads, and preventing rotation of the nut even under severe vibration.

Manufacturer claims that the nut may be removed and reused many times without losing its locking power, and without injury to the threads of the bolt. Device is available with National Coarse and National Fine threads in sizes from $\frac{3}{8}$ to $2\frac{1}{2}$ inches.

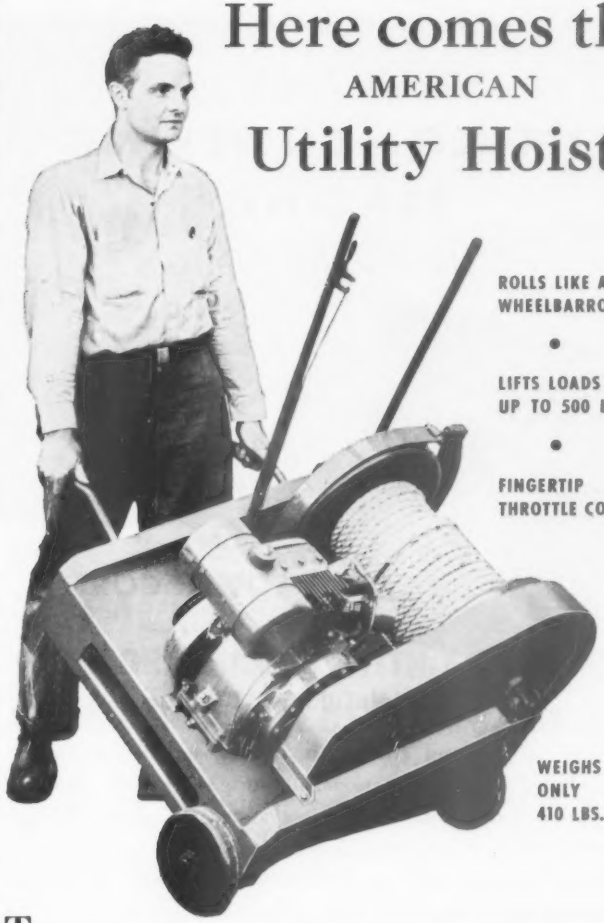
Security Locknut Corp., 1816 N. Long Ave., Chicago 39.

•

Magnetic Clutch and Brake Unit

Manufacturer states that magnetic clutch and brake units are capable of high torque with low current consumption. They are intended for use as a straight-forward driving clutch, a simple brake, as a combined driving clutch and brake, as a reversing

Here comes the
AMERICAN
Utility Hoist!



The AMERICAN UTILITY HOIST will lift brick, tools, cement blocks, roofing or any other load up to 500 lbs. more profitably than any big hoist on the market. And compared to hand work, it's worth two or three extra men on the payroll.

Here, at last, is a light hoist that's an all-around performer, offering exactly the kind of speed and power you need. The drum will spool 1700 feet of $\frac{3}{8}$" wire rope, or 400 feet of $\frac{3}{4}$" manila. With standard gearing it lifts 500 lb. loads at 200 feet per minute. If you want extra power, order special gearing to handle 650 lbs. at 150 FPM; or for extra speed you can have it geared for 200 lbs. at 500 FPM.

This hoist goes anywhere . . . and anybody can run it. Haul it on a light truck . . . wheel it to the job like a wheelbarrow . . . counterweight it with a heavy plank in the slotted frame, and you're ready for work. Fingertip throttle control is right on the brake lever. Has 14" disc clutch, 16" external band brake, governor-controlled air cooled engine. Immediate delivery from stock. Call your distributor, or write us direct, for catalog.

American Hoist
and DERRICK COMPANY
St. Paul 1, Minnesota

Plant No. 2: So. Kearny, N. J.

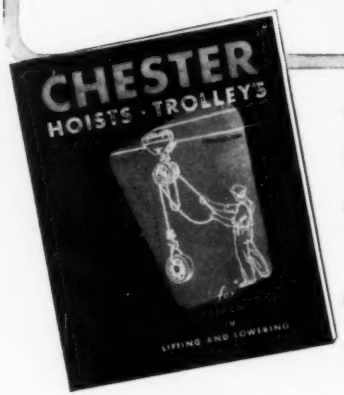
Sales Offices: NEW YORK, CHICAGO, PITTSBURGH

20
AMERICAN HOIST & Derrick Co.
ST. PAUL 1, MINNESOTA
Please send literature and prices on the AMERICAN Utility Hoist.
Name_____
Company_____
Address_____
City_____ State_____
9115

Here's Help in

LIFTING • LOWERING
PLACING

of Heavy Materials



- **EASIER**
- **FASTER**
- **SAFER**

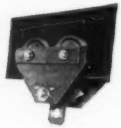
. . . at

- **LOWER COST**

Send for Helpful New Catalog

Chester Hoists and Trolleys, in their basic forms and a number of special adaptations, are being successfully used in every type of industry. Time and again, they have *proved* themselves to be a self-liquidating investment in better materials handling—by saving valuable man-hours, eliminating damaged materials and production delays. This new catalog tells you why—and how. Send for it today!

CHESTER SPUR GEARED CHAIN HOISTS. Sizes from ¼ ton to 25 tons. Timken bearings insure smooth operation, long life. Retaining break holds load at any position.



CHESTER TROLLEYS. Available in either plain or geared types, with either Timken or plain bearings.

CHESTER DIFFERENTIAL HOISTS. Designed for use where occasional lifting is required at minimum expense. Made in ¼, ½, 1 and 1½ ton sizes.

THE NATIONAL SCREW & MFG. CO.

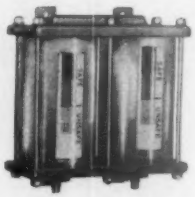
Chester Hoist Division • Lisbon, Ohio

clutch, or as a safety device to prevent overloading in both mechanical and electrical transmission systems.

Device is capable of being remotely controlled for instantaneous, delayed, or variable application. It operates either within a gear box or in its own nonpressure oil bath. Torque transmission is independent of speed.

Autronic Developments, Ltd., 240 E. 61st St., New York 21.

•



Filter-Dehydrator Unit

For use in vacuum or pressure processing systems requiring dry air, filter-dehydrator unit is equipped with transparent tubes containing silica gel of the relative-humidity-indicating type. Characteristic colors of the silica gel are shown on attached color card at 0, 20, 40, and 60 per cent relative humidity.

Four standard types and sizes are available. Tube diameter and length may be modified to conform to installation requirements. Tubes are designed for series or parallel flow. Wire mesh screens and filter pads augment the silica gel crystals in removing air dust and foreign matter.

Lear, Inc., Romec Div., Elyria, O.

•

Circuit-Breaker Panel Board

Small control panelboard, called the "12 to 20 Circuit" MO Panelette, incorporates thermal-magnetic circuit breaker units that plug-in on cylindrical bus bars, and are interchangeable with those of manufacturer's NMO panelboard. Available in 12, 16, and 20 circuit combinations for either 3- or 4-wire service, they are suitable for service entrance applications where circuit breaker mains are required or with lugs-only mains. Boxes measure 12x4 inches;

POST A KEEP OUT SIGN TO WEATHER AND CORROSION... WITH FLINTKOTE HYDRALT PROTECTIVE COATINGS

These Modern Asphalt Emulsions are specially formulated to meet specific requirements for Protection

EVERY tank, insulated pipe, refrigeration or wall coating job has its problems. And there's a Hydralt* Emulsion to solve most of yours. For *versatility* is an outstanding Hydralt characteristic.

Durability is another trait of Hydralt coatings. Exceptional durability. The same qualities that keep this coating stable under heat and prevent cracking at low temperatures, also render Hydralt highly resistant to weather. Test panels with more than 20 years exposure show Hydralt still doing its job.

Why is Hydralt so superior? Because the mineral colloid type *emulsion* creates a protective film reinforced within itself. It will outlast any other form of bituminous coating exposed to weather.

Emulsification brings other advantages. Hydralt requires no heating. It's completely fire-safe and nontoxic to apply. And the coating will not craze or alligator.

Hydralt Protective Coatings come in consistencies for spray, brush or trowel application . . . depending on the job to be done.

And, when you want to brighten up, use Flintkote Aluminum Paint. It's especially designed for use over asphalt. You get light, bright, attractive color . . . plus light and heat reflectivity.

Get complete information on these superior protective coatings that can do so many jobs for you. Write us today. We'll rush you detailed data sheets. *T. M. Reg. U. S. Pat. Off.

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Industrial Products Division
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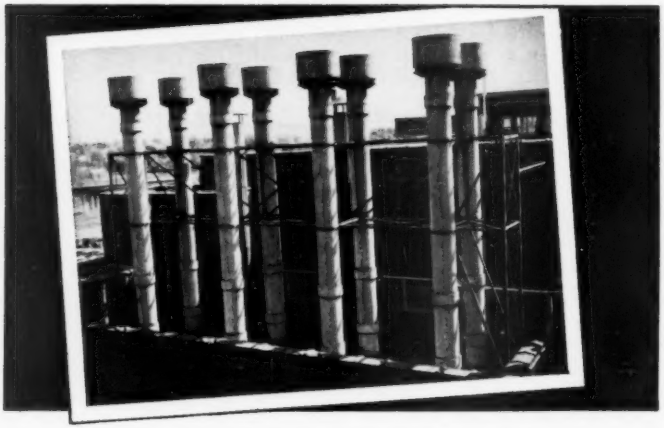

Records show long service in tough service . . .
for Transite Industrial Vent Pipe

In installations in many industries where corrosive fumes, vapors, dusts, and gases are encountered, Transite Industrial Vent Pipe is yearly demonstrating the fact that it is a practical, economical answer to tough venting problems.

Workable: Transite can be cut and drilled on the job.

Because it is an asbestos-cement product, this strong, durable pipe stands up in many types of corrosive service . . . helps avoid costly replacement . . . results in important reductions in plant maintenance.

Easily installed—Transite Industrial Vent Pipe has many practical installation advantages. It is light in weight and easily handled. It is readily worked and can be quickly cut and drilled on the job with ordinary tools.

Easily adapted—Made in a range of sizes up to 36" in diameter, Transite Industrial Vent Pipe is readily adapted to use as vents, ducts, and stacks. A full line of Transite fittings provides a venting system that is corrosion resistant throughout.

Adaptable: A complete line of Transite fittings meets most job requirements.

Economical to maintain—Transite is completely rustproof... highly weather resistant . . . needs no painting . . . resists corrosion outside, inside and all the way through. For full details about Transite Industrial Vent Pipe, write Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville TRANSITE Industrial Vent PIPE

for surface or flush installation in shallow walls.

Square D Co., 6060 Rivard St., Detroit 11.

•

Scoop and Roll Clamp

Paper scoop and roll clamp attachment handles rolls of paper up to 50 inches in diameter, weighing up to 5500 pounds. May be manually adjusted for a tilt of from 0 to 3 degrees. Load rolls off when clamp is released.

Towmotor Corp., 1226 E. 152nd St., Cleveland 10, O.

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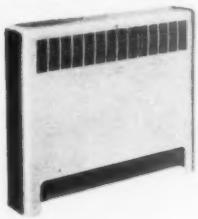


Convector Radiators

Line of convector radiators includes six standardized types for use on hot-water or 2-pipe steam system installations. Free-standing type, illustrated, may also be installed as a semi-recessed model. Other models include wall-hung (sloping top), partially recessed, fully recessed, bathroom, and institutional types.

Young Radiator Co., 610 Wisconsin Ave., Racine, Wis.

•

Screw-Holder

Screw-holding tool is designed for starting screws in "hard-to-get-at" places. Set has 10-, 7-, and 4½-in. holders, for 3/16- and ⅛-in. widths. Handles are of solid-set wood.

Handy Industries, 141 W. Jackson Blvd., Chicago 4.

•

Wall-Crack Filler

Self-sealing wall-crack filler, called "Shel-Plas," allows user to repair as he paints, according to manufacturer.

But what about the DISAPPEARING ACT *in your plant?*

You might be even more mystified to discover just how much of the electric power you pay for isn't there when it gets to the machines. It's the black magic of overloaded, over-extended, obsolete wiring* that slows down motors and men.

Your plant power engineer, consulting engineer, electrical contractor or utility power salesman knows how to materialize your vanished power. Better ask . . . *soon.*

***WIRE AHEAD** . . . a comprehensive discussion of preventive maintenance, points out the symptoms of inadequate wiring, presents detailed plans for anticipating electrical demand. Forty-eight factual pages of practical information and suggestions free on request.

Densheath Type TW Building Wire with its special thermoplastic insulation is sound production insurance in any plant. It will not support combustion, is long-aging, impervious to acids, oils and alkalis. It is recognized by the National Electrical Code for circuits up to 600 volts and temperatures up to 140° F. . . . and for wet and oily locations. Being light weight, with a smooth, slick finish and without braid, Densheath pulls through easier . . . resists abrasion. Permanent, bright colors for quick circuit identification. Write for literature.

This is important, too—*for rewiring in existing raceways*, the Code recognizes the smaller diameter of Densheath TW and permits more conductors to be pulled in the same size conduit. Below, a typical case— 49437

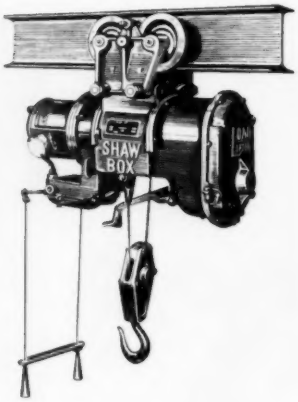
½" CONDUIT

Type R	Type TW
3 #10 Wires	6 #10 Wires

ANACONDA
from mine to consumer

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4, N. Y.



This will do it!

Granted the lifting job is tough! Installations difficult! Conditions hard on men and hoist alike since loads are capacity or near-capacity all day long! Breakdowns are frequent with production slowed up all over the place.

If that's the picture in your plant, you need a 'Load Lifter' Electric Hoist. 'Load Lifters' are heavy-duty hoists, so ruggedly constructed they'll tackle the toughest lifting job within their capacities. Tackle and lick it — for a 'Load Lifter' will lift capacity loads many times an hour every hour in the day.

'Load Lifter' Hoists require very little attention — superior construction and special mechanical features built into the hoist reduce hoist service to a minimum to give you dependable, all-year round performance.

You may have other reasons for wanting an electric hoist but, whatever they are, a 'Load Lifter' is the least expensive to buy and use.

'Load Lifter' Electric Hoists are built with lifting capacities of 500 to 40,000 lbs. in all combinations required for industrial needs. They are adaptable to almost every working condition within their capacities. Send for Catalog No. 215.

MAXWELL MANNING MOORE TRADE MARK

'LOAD LIFTER' *Hoists*

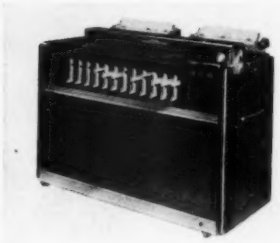
MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments.

Oil base is said to stop waste of paints caused by lime burns and shellac stains. Suitable for use under all flat paints and oil flat, it may also be used in caulking gun to seal doors and windows.

Benwell Corp., 3010 Book Tower, Detroit 26.

•



Electronic Statistical Machines

Single unit sorts, counts, accumulates, balances, edits, and prints statistical information. Its maker claims that it will distribute unit counts into as many as 60 different classifications at high speed, and will sort basic data at 450 cards a minute.

Other office equipment of similar nature includes an accounting machine with wheel printing that accumulates and lists information from cards; a simple card punch; a card-programmed electronic calculator; an electronic collator; a device permitting use of cards in automatic operation of electric typewriter; a proof machine for sorting and listing bank checks, sales slips, and similar documents; and a flexible time recorder.

International Business Machines Corp., 590 Madison Ave., New York.

•

Rubber-Insulated Clips

Line of clips, clamps, and fasteners is rubber insulated, and available in many different shapes and sizes. Units are designed to prevent slipping, cutting, and rattling when holding wire, tubing, cable, or rod material. Exposed metal ends can be rust-proofed, zinc- or cadmium-plated, lacquered, or enameled.

Automotive Rubber Co., Inc., 8601 Epworth Blvd., Detroit 4.

•

Protractor Welding Clamp

Tool, called "Pro-Clamp," holds parts for brazing or soldering. Made on a U-shaped frame, it has clamps at each end to hold parts in place. Clamps can be pre-set at any angle from 0 to 1880 degrees. Frame is inscribed with two protractor scales.

Construction is of light-weight,

MINNEAPOLIS-MOLINE
MM
MODERN MACHINERY

INDUSTRIAL WHEELERS

Preferred for OUTSIDE PLANT JOBS!

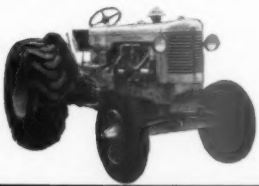
You can put loading crews on production jobs by using MM Industrial Wheelers to handle all types of bulk or palletized material with big savings in time and dollars.

Mobile MM Industrial Wheelers are available with the Shuttle Gear for 6 forward and reverse speeds up to 14.5 m.p.h.

Easy handling is the result of MM engineered Roller Spin Steering that makes fast maneuvering easy and reduces operator fatigue.

High capacity—up to 10,000 lbs. on the front end and heavy duty, extra-diameter clutches make MM Industrial Wheelers the outstanding choice for heavy industrial application.

For doing all your jobs, various attachments are available including loaders, dozers, scrapers, mowers, broom and winch. They can be installed simply and easily on mounting pads that are part of the tractor.

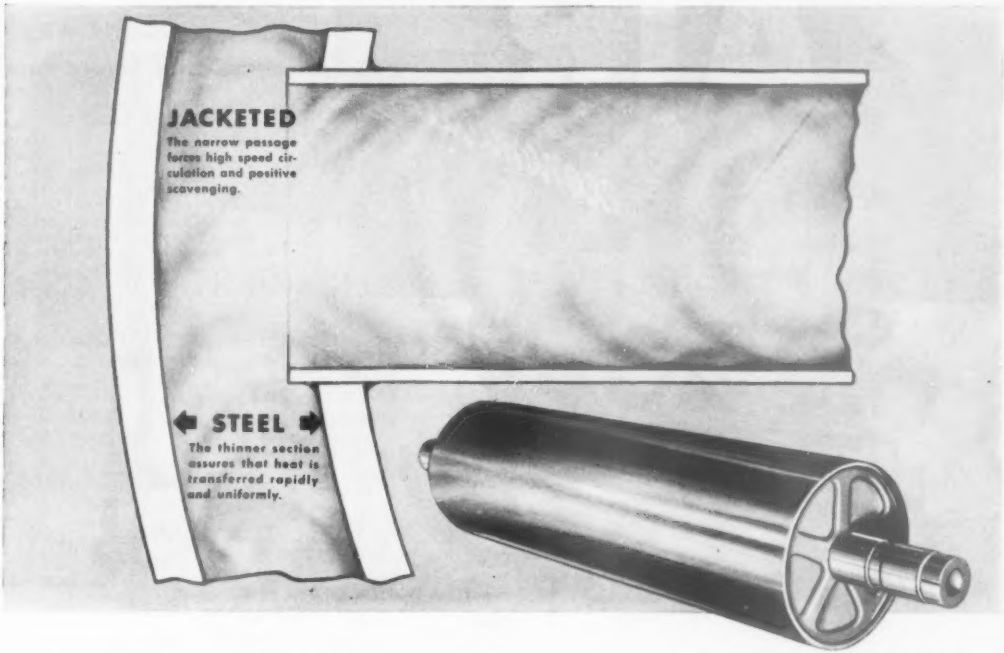


MINNEAPOLIS-MOLINE

MINNEAPOLIS 1, MINNESOTA

YOU GET MORE HEATING DRYING CHILLING CRYSTALLIZING HARDENING OUTPUT

from steam (or coolant) *this way*


JACKETED
The narrow passage forces high speed circulation and positive scavenging.
STEEL
The thinner section assures that heat is transferred rapidly and uniformly.

Lukenweld Jacketed Steel Rolls move heat rapidly—in or out. Their welded steel plate construction permits thin sections. Whether the task is heating or chilling, surface temperatures are more uniform and constant.

High steam pressures are employed with safety with Lukenweld Rolls. Records covering dozens of installations in a variety of industries show production increases of more than 60% over old style rolls. Bulletin 358 tells you more about them.

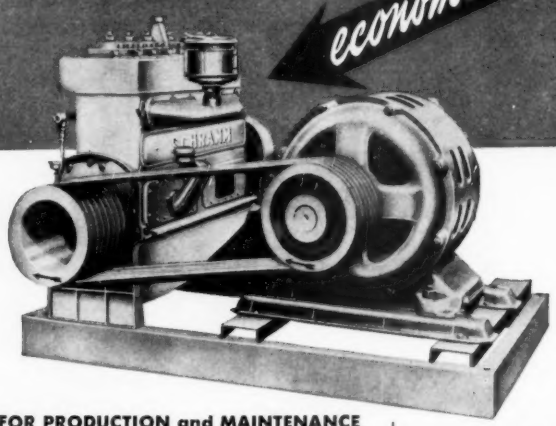
If you're interested in learning what Lukenweld Jacketed Steel Rolls will do for you, if you're needing an addition to present equipment or a complete new machine, get in touch with us. Lukenweld, Division of Lukens Steel Company, 421 Lukens Building, Coatesville, Pennsylvania.

Come see us at the Metal Show in Cleveland, October 17-21, Booth 503, and the Chemical Show in New York, November 28-December 3, Booths 558-563.

LUKENS
LUKENWELD DIVISION ★

DESIGNERS, ENGINEERS AND MANUFACTURERS OF MACHINERY

MORE AIR economically!



- **FOR PRODUCTION and MAINTENANCE**
- **FOR SPEEDY PNEUMATIC TOOLS**

SCHRAMM INC. offers a complete line of Industrial Compressors in sizes ranging from . . . 2 to 600 cubic feet displacement . . . Built and designed for continuous heavy duty service with a minimum of attention.

Available in "V" or Flat Belt Drive . . . on base for belt drive from motor or engine . . . or, with direct motor drive. No special foundation required . . . can be bolted to any substantial floor.

Where running water is not available the SCHRAMM Cooling Unit will prove adequate under severest conditions. Accessories essential to any modern industrial installation can also be provided.

Write for Bulletin #4910.

Important Features

- Compact...Easy To Install
- Mechanical Intake Valve
- Force Feed Lubrication
- 100% Water Cooled
- Electric Push Button Starting
- En Bloc Construction
- Easy Accessibility
- Vibrationless
- More Bearing Surface

SCHRAMM INC.

THE COMPRESSOR PEOPLE

WEST CHESTER PENNSYLVANIA

high-strength alloy, which resists weld spatter. Device accommodates thickness and diameter from 0 to 1 inch. Its over-all dimensions are 5½x8 inches; weight, 3 pounds.

Bernard Welding Equipment Co., 741-43 E. 71st St., Chicago 19.

•

Single-Outlet Safety Panel

Metal wallbox, called Safelet, combines an auxiliary circuit breaker, an outlet, and a pilot light. Electrical apparatus plugged into it is protected by the magnetic circuit breaker against overloads and short circuits. Pilot light remains on while circuit is in use. Standard ratings are 115 volts, 6, 10, and 16 amperes; 230 volts, 6 and 10 amperes; other ratings to 50 amperes are also available.

Heinemann Electric Co., Plum St., Trenton, N. J.

•

Portable Lifter

Of 1000 pounds capacity, portable hoister is arc-welded throughout. Wheels are equipped with roller bearings, and caster steer provides maneuverability in confined areas.

Standard model has lifting platform 24x30 inches, lowered height of 5½ inches, and lifting height of 58 inches. The over-all height is 76 inches. Winch raises and lowers carriage 1½ inches per crank revolution. Floor locks secure the hoister while loads are being moved.

Lewis-Shepard Products Inc., 266 Walnut St., Watertown 72, Mass.

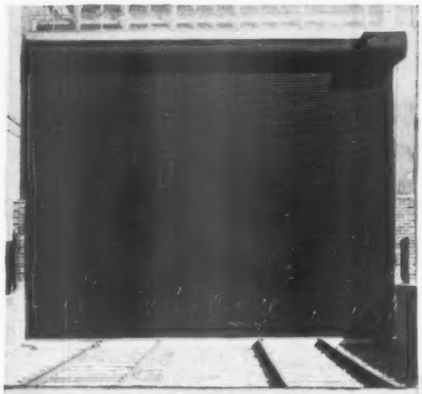
•

Valve Actuator

Lightweight diaphragm valve actuator is claimed to be leakproof and to have long life. Diaphragm is protected from excessive pressures by adjustable positive stop. Pneumatic pressures up to 105 psi. may be used, but 50 pounds of actuating pressure will close valve against 100 pounds

Rolling Steel DOORS

Manually • Mechanically • Power Operated



RAILROAD OPENINGS

Rolling Steel Doors are ideal for Railroad Openings in Industrial Plants, Warehouses, etc. These doors can be furnished for openings accommodating one, two, or three parallel tracks. You may select from Two Types of Mahon Power Operators and several control arrangements.

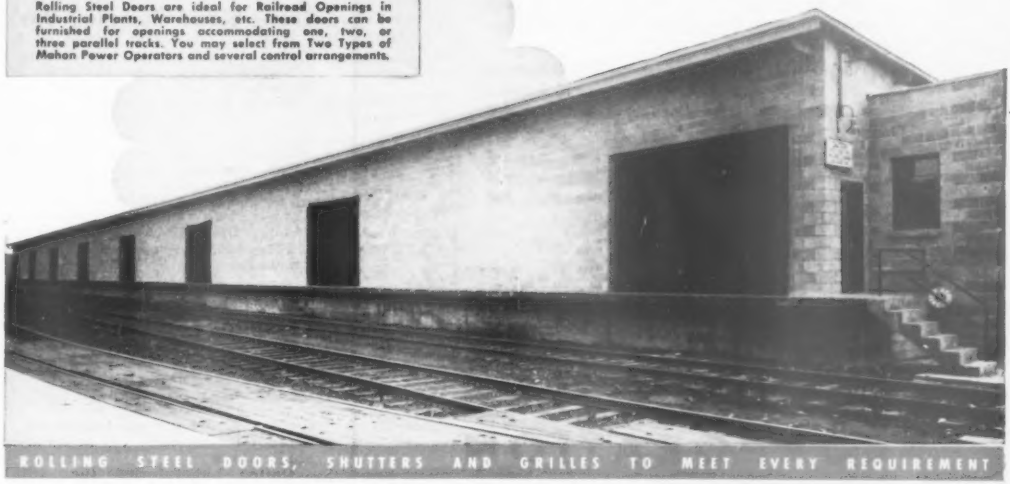
Vertically acting Rolling Steel Doors allow 100% usable space adjacent to the door opening . . . they coil up clear of the opening safe from damage while the opening is in use . . . they provide the maximum in protection against intrusion and fire—and the permanence of all steel construction assures a lifetime of trouble-free service. When you specify Mahon Rolling Steel Doors, you may be confident of the latest developments in doors of this type, and a greater dollar value. See Sweet's Files for detailed information, complete specifications, installation details and clearance dimensions.

THE R. C. MAHON COMPANY

Detroit 11, Michigan • Western Sales Division, Chicago 4, Illinois

Representatives in All Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Underwriters' Labeled Rolling Steel Doors and Fire Shutters. Mahon Steel Deck for Roofs, Partitions, Acoustical Ceilings, and Permanent Floor Forms.



ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Thirty Mahon Rolling Steel Doors are installed in the above freight transfer dock constructed for the Wabash Railroad.

MAHON

Special-Purpose SYSTEMS

designed to meet individual requirements, including:

CONVEYORS

PNEUMATIC TUBE SYSTEMS

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AUTOMATIC PALLET LOADERS

INDUSTRIAL VACUUM CLEANING SYSTEMS

DRYSET VACUUM SYSTEMS FOR GARMENT PRESSES

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Lamson Corporation puts at your service expert consulting, engineering and installation service based on broad research and experience in thousands of comparable installations.

Frequently standard systems, modified in only minor details, are adequate to handle complex jobs. Others are designed from the floor up.

Write for descriptive bulletins on any of the above equipment. A wire or letter will bring a technically-trained field man for consultation.

LAMSON

CORPORATION

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Branch Offices in Principal Cities

pressure in the line being controlled.

Available in three combinations: Air-to-close; air-to-open; and double acting. Sizes range from ¾ to 6 inches.

Grinnell Co., Inc., 200 W. Exchange St., Providence 1.

•

Multi-Purpose Projector

Projector handles slidefilm, 2x2-in. slides, or both slides and slidefilm. Maker says that the operator can switch instantly from one medium to another. Slidefilm unit slips in and out of projector. Light source is 300 watt bulb.

American Optical Co., Southbridge, Mass.

•

Three-Sided Dumping Box

Skip box dumping device is designed to tilt the box while elevated, to carry heavy loose materials in loads up to 4000 pounds.

Box is three-sided, and fitted with metal rings at the back. Hooks on the truck carriage engage the rings when box is lifted by the forks. To dump, operator actuates a double-acting hydraulic cylinder which raises the hooks, tilting the box forward, allowing the load to flow out through the open front.

Towmotor Corp., 1226 E. 152nd St., Cleveland 10.

•

Protective Floor Coating

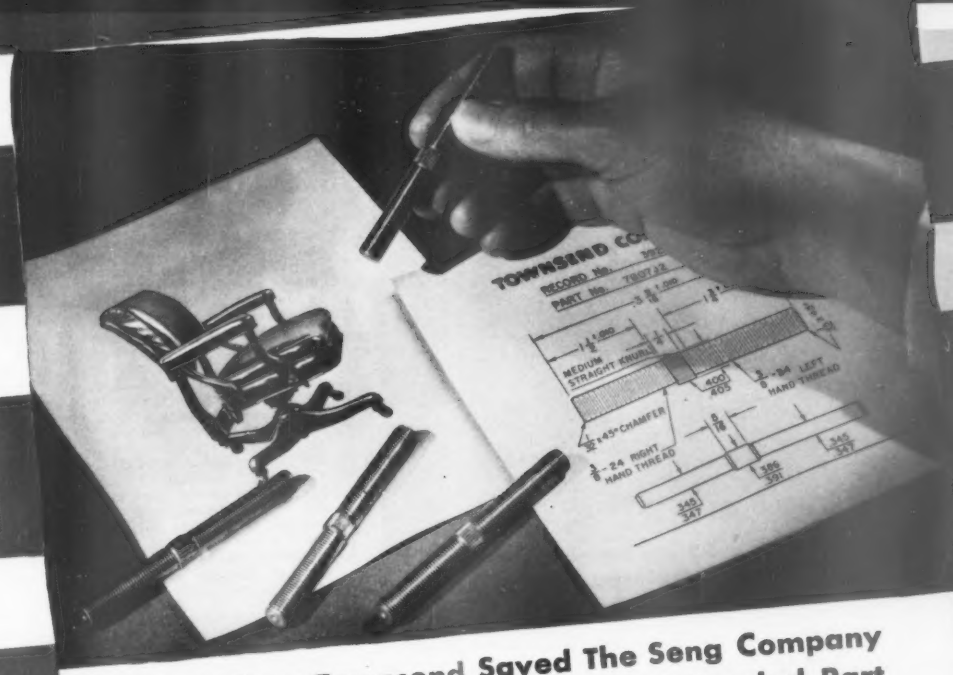
For use on asphalt and concrete floors subjected to alkalis, oils, greases, or other destructive elements, floor surfacer, called Quartex, may be applied directly over the old surface. Under normal conditions, it is ready for use within 36 hours after applications.

United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12.

•

Automatic Emergency Valves

Two valves, called "Sentry," are designed to provide automatic line



Here's How Townsend Saved The Seng Company $27.63 Per Thousand On One Cold Headed Part

This is an example of how a Chicago manufacturer, *who might have been you*, saved a large amount of money through the use of a Townsend cold headed part and thereby produced a better product for less money. The threaded adjusting screw (illustrated above) for the tilt back of the Seng action control for executive chairs is now being produced at Townsend by cold heading, knurling and roll threading for only $16.87 per thousand. The lowest price quoted for screw machine production was $44.50. This clear saving of $27.63 per thousand is important because Seng chair action control production is extremely high. Not only that, the Townsend part, being cold formed, is stronger than a part machined from bar stock and the roll threads are tougher and more uniform than machined threads. This gives The Seng Company an adjustment screw that works easily and helps produce a better chair at less cost.

This is not an isolated case with Townsend engineered parts and fasteners. It is typical of how Townsend helps save money and time by working closely with manufacturers in designing parts for many applications. Townsend parts and fasteners are cold headed, pointed, machined, drilled, slotted, trimmed, roll threaded, extruded, pierced, knurled, bent or flattened. They are produced in carbon, alloy and stainless steels—in brass, bronze, copper, aluminum—in a variety of platings and finishes.

To find out how to reduce costs and improve your products with Townsend cold headed parts send us a sample or sketch of the parts you need. Our engineers will gladly give you an estimate without obligation.

Call or write today to:

Townsend

COMPANY — ESTABLISHED 1816

New Brighton, Pa.

Chicago 38, Ill.

Here's what "KEX" NATIONAL SERVICE IS

. . . and why your plant can benefit from it

KEX NATIONAL SERVICE is a logical means of solving your industrial wiping problems by simply renting towels specifically made for wiping.

HERE'S HOW "KEX" NATIONAL SERVICE WORKS!

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KEX NATIONAL SERVICE is as near as your telephone.

2

KEX INDUSTRIAL WIPING TOWELS are delivered to you in the quantities you want as you need them.

3

They are tied in neat bundles for easy storage, convenient handling and control of distribution.

4

KEX TOWELS are soft woven cotton—no abrasives to mar delicate surfaces—bound edges for safety—uniform in size—super-absorbent and clean.

5

Service is automatic—Pick-up of used towels and delivery of fresh ones are on a clock-work schedule that you make.

Manufacturers in every type of industry who have a wiping problem have found KEX NATIONAL SERVICE the efficient, economical way of solving it.

Look for this symbol in your local Classified Telephone Book. It identifies your nearest KEX distributor. Or write for details to KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N.Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

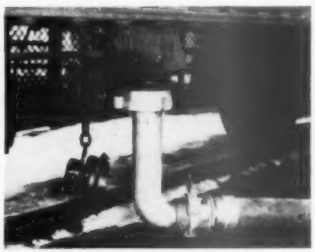
control in the event of fire or other emergency. One model, a shut-off valve closes gas, fuel oil, or other "hot" lines entering the danger zone. Small tube in which nominal pressure is maintained is connected to the valve and carried to any part of the plant. Self-operating mechanism automatically closes whenever the seal on the control line is broken. As many control points as desired, of one or several types, may be placed in the single line to operate one or any number of valves concurrently.

The other type automatically provides a deluge of water at full line capacity, directed to any critical area requiring flooding. It may also be used for automatic dumping of tanks and pressure vessels, full pressure feed for steam, fog, or CO_2 fire smothering systems.

Both valves are actuated whenever any emergency breaks the fusible seal on the control line. They are both self-contained, and not dependent on outside power or manual control.

McRae Valve Corp., 620 S. Main St., Los Angeles 14.

•



Tank Car Unloading Fitting

Weighing less than 10 pounds, tank car unloading fitting is available in lengths of 10 and 15½ inches. Standard thread in the fitting collar adapts it to all tank cars.

Standard fittings are made of cast aluminum, with a 3-in. outlet pipe thread. It is also available on order in any cast metal, and with a 4-in. outlet pipe if desired.

The Mead Cornell & Co., Box 2682, Cleveland 7, O.

•

Motor Control Switch

Controlling motors up to 2 horsepower, switch in both single- and double-pole models has slow break action. Unit has silver contacts, operates on 30-amp, 240-volt a.c. circuit. Switch box measures 4x2⅜ x 2¼ inches, has knockouts on five sides. Toggle guard permits locking in either off or on position.

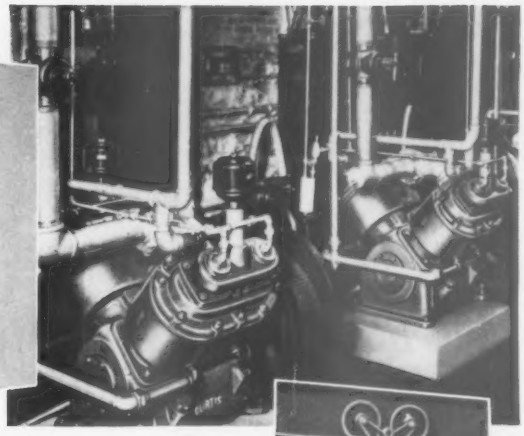
The Hart Mfg. Co., 108 Bartholomew Ave., Hartford, Conn.

•

Electrical Differential Speed Drive

Infinite speed range, down to and including zero, with constant torque, under automatic control, is provided by electrical differential speed drive.

Reduce Production Costs with CURTIS AIR COMPRESSORS, AIR HOISTS AND AIR CYLINDERS



Plant after plant is turning to Curtis Air Hoists and Cylinders for pushing, pulling, lowering or lifting operations . . . and to multiple installations of Curtis Air Compressors, which eliminate long air lines, the possibility of air leaks, and losses resulting from breakdowns of central air compressor installations.

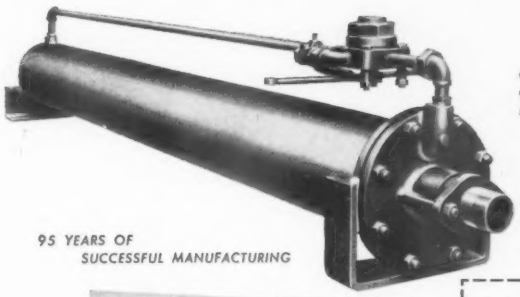
Here's why it will pay you to consider CURTIS *equipment*

AIR HOISTS AND AIR CYLINDERS

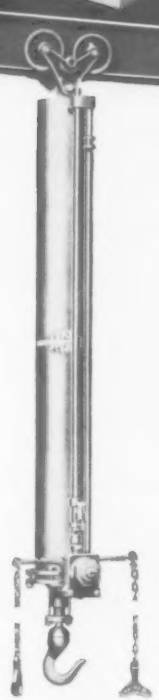
- Cannot be overloaded.
- Hoisting or lowering speed is controlled by operator.
- Ground-steel cylinder.
- Disc type valves.
- Valve automatically returns to vertical position when released.
- Can be operated by unskilled labor.

AIR COMPRESSORS

- Timken-Bearing equipped—permits external adjustment.
- Self oiling—positive lubrication.
- Precision construction throughout.
- Complete valve assembly removed or replaced in a few moments.
- Cylinder, crankcase, also heads made from gas-tight iron.
- Fully enclosed.



Curtis bracketed-type Air-Hoist Cylinder can be placed in any position from horizontal to vertical.



Curtis Pendant Air Hoist can be used for practically any lifting problem where the head room is not limited.

95 YEARS OF SUCCESSFUL MANUFACTURING

CURTIS

PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1995 Kienlen Avenue, Saint Louis 20, Missouri

Curtis Pneumatic Machinery Division of Curtis Mfg. Co. 149-4
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I am interested only in items checked below:

- ☐ Air Hoists
- ☐ Air Cylinders
- ☐ Air Compressors

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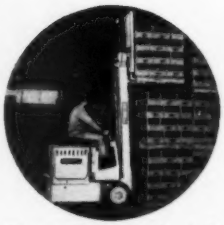
Handling Simplified in Large Foods Warehouse—"Fits like a glove" into our handling operations. That's how this large food company describes the Mercury "Jeep."

This modern, one-story warehouse, designed for maximum storage, enables the Mercury "Jeep" to utilize its *compact size*, *power* and *easy maneuverability* to the utmost. 2000 lb. pallet loads are tiered to 18 foot heights . . . materials are handled, hauled and stacked with ease. *All* by one man and the Mercury "Jeep."

Learn how these economies can serve you. For on the spot consultation, ask a Mercury Sales Engineer to call.



Mercury "Jeep" quickly stacks 2000 lb. pallet load.

One Man and a Mercury "Jeep" DO THE JOB!

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4110 S. Halsted St., Chicago 9, Ill.

TRACTORS • TRAILERS • LIFT TRUCKS

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In the processing of web materials, it will maintain constant tension or decreasing tension between a machine and a winding stand or between two parts of the processing machine to provide a smooth flow of the material.

Driving motor may be mounted either horizontally or vertically. Unit is available in any required size and capacity. May be used with hoists, planers, gear mounts, textile, machinery, rubber, paper, and other web applications.

Speed Control, Inc., 1378 Depot St., Wickliffe, O.

•

Electric Stapling Machine

Single-contact control on electric machine speeds up stapling of forms, correspondence. Stapling action is instantaneous upon insertion of paper into machine. No manual or foot controls are needed, nor is operation dependent upon timing by operator. Calibrated scale on machine guides user in selecting proper stapling position. Adjustment of control knob permits regulation of depth. Standard staples are fed through the front opening of the machine without dismounting the machine.

The Staplex Co., 452 50th St., Brooklyn 20, N.Y.

•

Air-Steam Line Purifier

Line purifier, Type RA, removes oil, water, pipe scale, rust, and sediment from compressed air and steam lines. Unit has helicoid tuyere, constructed of monel or stainless steel, for positive separation of entrainment. Centrifugal action is claimed to push solids down inside wall of purifier body to drain pocket.

Constructed of forged steel, unit is installed with threaded inlet and outlet connections. It has no moving parts, and can be used in either horizontal or vertical downflow position. It is intended for use on steam lines up to 400 lb. gage and 650 degrees F.; for air or gas not exceeding 800 lb. gage and 100 degrees F.

Centrifix Corp., 3029 Prospect Ave., Cleveland 15.

•

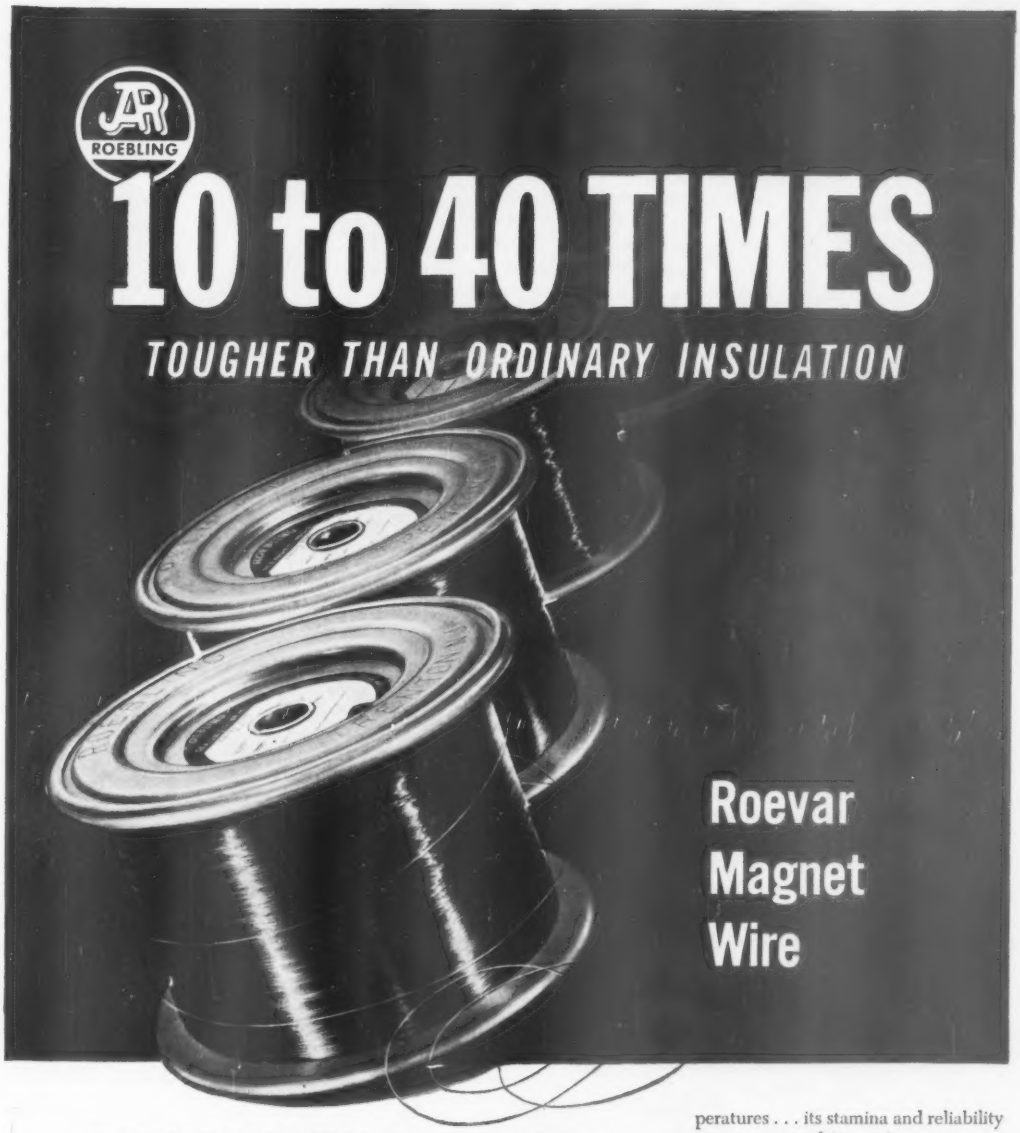
Furnace Explosion Safeguard

Combustion safeguard, called "Electronic Pyrotrol," protects gas-fired furnaces, ovens, and similar industrial heating equipment from danger of gas explosions during ignition, operation, and shut-off. Unit is designed to perform all steps in light-

JR ROEBLING

10 to 40 TIMES

TOUGHER THAN ORDINARY INSULATION



BEST WIRE FOR HIGH-SPEED WINDING

COMPARATIVE TESTS prove a fact that's highly important to magnet wire users . . . the insulation of Roevar Magnet Wire is 10 to 40 times tougher —more resistant to abrasion—than other types of insulation! This means that Roevar is far and away your safest choice for all high-speed winding operations.

On top of that, the insulation of Roevar Magnet Wire bends and stretches remarkably without cracking or loosening from the conductor. It has high resistance to the solvents in coil-treating varnishes and to baking temperatures . . . its stamina and reliability are unsurpassed in service.

Roevar Magnet Wire is smaller in diameter than magnet wire with enamel, silk, cotton or paper insulation *and it costs less!* It comes in sizes No. 14 to 40 A.W.G. Roevar might be a big help to you. Write for full data and samples of wire. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave. So.

ROEBLING

☆ A CENTURY OF CONFIDENCE ☆

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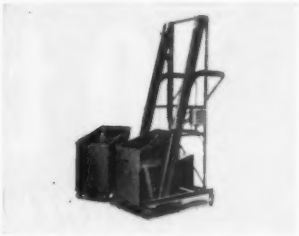
See Bruning Office Copying Systems Exhibit in spaces 12 and 14 at the National Business Show, Grand Central Palace, New York City, Oct. 24 through 29.

ing a gas appliance safely. If normal operation fails, lighting-up cycle stops and any open valve is closed. If power supply fails, entire system shuts down.

The Bristol Co., Waterbury 91, Conn.

•



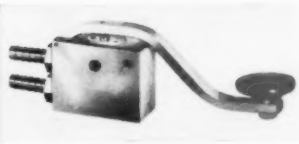
Portable Dump Elevator

Called Cesco Dumper, portable elevator lifts, up-ends, and dumps 750-lb. loads; capacity, 100 loads per hour, according to manufacturer. Unit is adjustable to handle bags, drums, barrels, and boxes. Made in 6 standard dumping heights ranging from 5 to 12 feet; special models up to 20 feet.

Safety features include slack cable, safety switch, automatic stops at top and bottom, 3-button control switch, and solenoid-operated brake.

Colson Equipment & Supply Co., 1317 Willow St., Los Angeles.

•



Air Valves

Three-way normally open air valves may be attached to any machine by means of mounting holes at top and sides. Of the poppet type, it is made in two models. The FT-102 valve has $^{3}/_{8}$-in. pipe thread apertures for use with air cylinders up to 6-in. bore. It is controlled by a handle-lever button. The FC-102 is the same except that it has no lever, but is operated by means of a suitably located cam or trigger on the working machine.

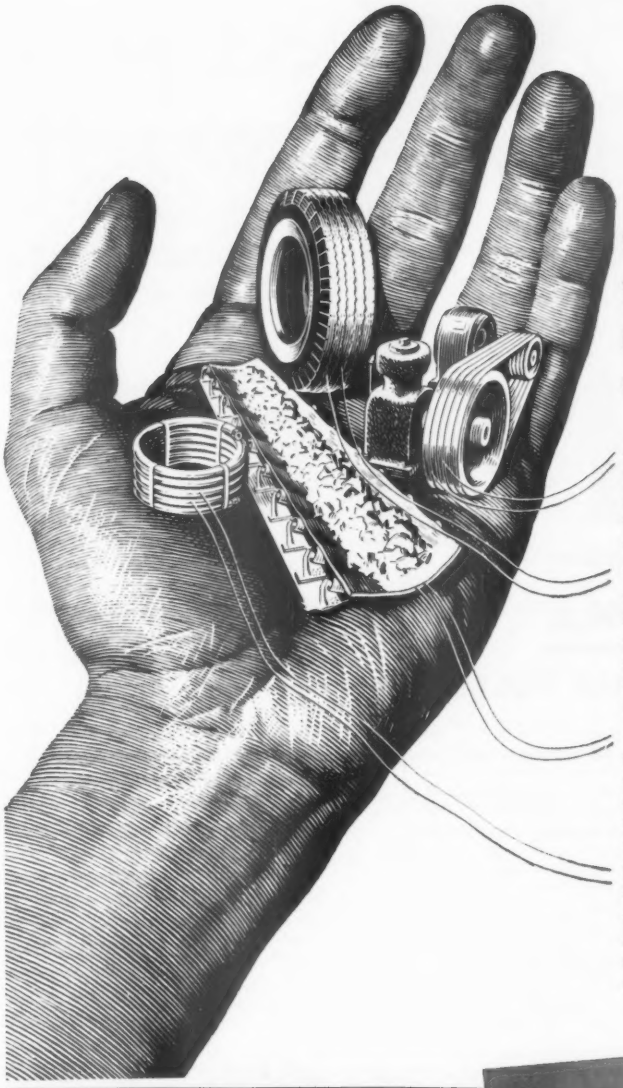
Mead Specialties Co., Dept. V-1 4114 N. Knox Ave., Chicago 41.

•

Smoke Detector

Designed to protect as many as four spaces simultaneously, smoke detector is equipped with a control cabinet and an analyzer tube. The cabinet contains an electric panel with automatic supervisional circuits, a constant voltage transformer, an exhauster fan, and a motor-driven selector valving system.

One or more accumulators are installed on ceiling and connected to rigid piping leading to control cabinet. Analyzer tube is mounted near control cabinet. Fire alarm and



Du Pont "Cordura" yarn gives these products high strength at low cost

V-BELTS made with Du Pont Cordura* High Tenacity Rayon are stronger . . . have longer life. Because of their strength, "stretch" is virtually eliminated. There is less slip. You have fewer take-ups and less maintenance.

TIRES run cooler, resist excessive bruising and ruptures under the most punishing operating conditions when the carcass contains "Cordura." The thinner carcass made possible by strong "Cordura" cords not only contributes to better performance, but also reduces raw material costs.

CONVEYOR BELTS sinewed with "Cordura" are light in weight. They're easier to carry about, install and take down. And for long-lift, fixed installations, "Cordura" provides necessary extra tensile strength plus remarkable troughability and resilience.

HOSE reinforced with "Cordura" offers many advantages. Safety factors can be well-nigh doubled. Or hose weight can be reduced—sometimes as much as 50%. And "Cordura"-reinforced hose has greater flexibility, extra durability.

*REG. U. S. PAT. OFF.

Let us help YOU profit with "Cordura"

Inherently stronger than natural fibers commonly used, and usually more economical, "Cordura" is a yarn you can't afford to overlook. Perhaps the uses described above suggest still another application to you. Write us about it . . . and tell us if you need data on the performance of this yarn under unusual operating conditions. We'll be glad to give you a detailed analysis of the application you have in mind, along with other helpful information. Write Rayon Div., E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

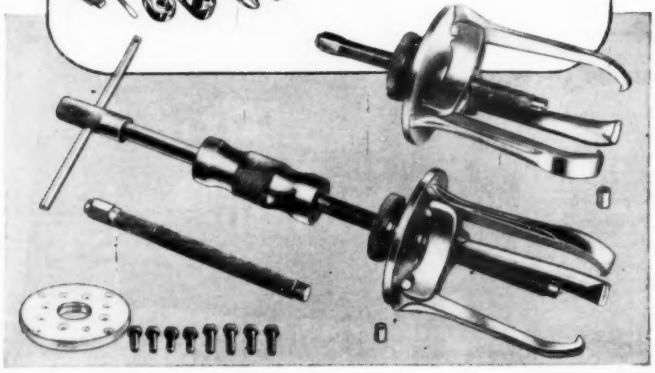
For rayon . . . for nylon . . . for fibers to come . . . look to DU PONT

Cut Pulling-Time Costs
with Snap-on's
Powerful THREE-JAW PULLER

This mechanic is removing the chain-driven main drive gear on an automatic screw machine. Note how the jaws spread to grip the wide chain-retaining flange. The circular locking plate tightens the jaws so that the puller holds its position without being held by the mechanic, leaving both his hands free for a fast, easy and safe pulling.

Efficient jaw capacity is 8½" on outside holds with a minimum of 2½" diameter opening for inside pulls. Different sets are available for conversion to a screw, slide hammer or combination type puller. Snap-on has 40 direct factory branches in key industrial centers. Write for data sheet and name of nearest branch.

SNAP-ON TOOLS CORPORATION
KENOSHA, WISCONSIN
8112-F 28TH AVENUE



trouble signals or bells may be located wherever desired.

Walter Kidde & Co., Inc., 675 Main St., Belleville 9, N. J.

•

Fluorescent Lamp Starter

Starter which will operate either 85- or 100-watt fluorescent lamps is available in both FS and COP types. Maker says it will function even under difficult conditions such as low line voltage with an ungrounded fixture, and current variations caused by differences in quality of ballasts.

Sylvania Electric Products, Inc., Salem, Mass.

•

Material Handling Baskets

Designed to step up material handling, heavy-mesh wire baskets are suspended in an X-frame. Mesh is self-draining, and parts can be run through baths without removal from carrier. Surfaces are heavily plated. Standard model measures 15x11x3½ inches.

Jaxon Wire Products, 1705 Probert Rd., Jackson, Mich.

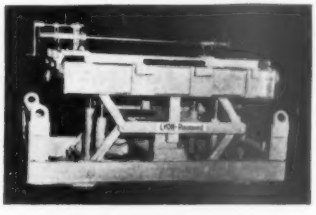
•

Spherical-Roller-Bearing Pillow Blocks

Pillow blocks are designed for spherical roller bearings that handle normal or heavy loads. Available in bore sizes from 2 7/16 to about 8 inches, units are self-aligning, have either felt or triple metallic labyrinth seals. They are built for straight shaft or adapter-type mounting.

Fafnir Bearing Co., New Britain, Conn.

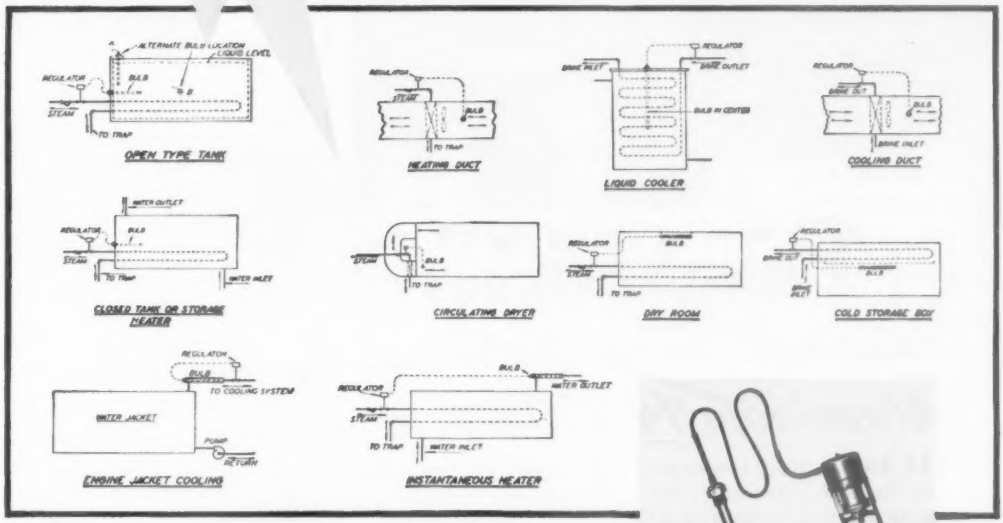
•



Heavy Duty Die Truck

Intended for handling large dies, 20,000-lb.-capacity hydraulic elevating truck has four lifting cylinders. Roller top has 3 removable retaining bars for safety. Range of operation is 28 to 44 inches. When die is placed on truck, 6 vertical posts ex-

Plans that may spark profit-ideas for you



10 TYPICAL APPLICATIONS

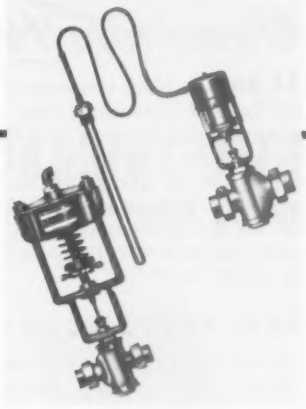
...Sylphon Temperature Regulators for accurate, economical process control

Pictured here are typical ways in which Sylphon Temperature Regulators are used to insure successful process control. They keep temperature *as wanted* . . . eliminate wasteful overheating . . . help prevent spoilage . . . maintain desired product quality.

Sylphon Regulators operate simply, economically and effectively. They're rugged, compact, self-powered and self-contained. And they're built by specialists in this field—backed by nearly half-a-century of experience.

Used in many industries, Sylphon Temperature Regulators are ideal for many types of equipment—washers, cookers, dryers, slashers, open and closed tanks, and others.

These "plans" may spark an idea for you—show you how one or more of the many types of Sylphon Regulators can help you improve processing operations, and cut costs. Write for information, and ask for free Catalog TF-20 that gives complete details on the full line.



Above: Sylphon Temperature Regulator No. 923. Available with dial indicating thermometer—also with fin type bulb for controlling temperature of air or gases. *Below:* Sylphon Regulator No. 952, one of the Sylphon line of *pressure regulators* for use in steam, air, water or oil lines.

FIRST WITH BELLOWS

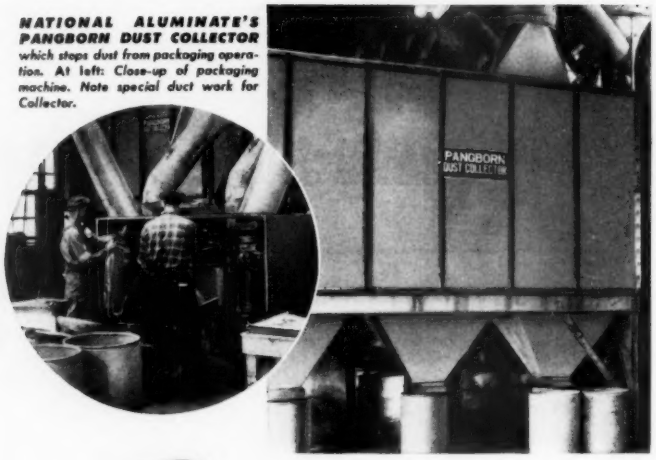
Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

NATIONAL ALUMINATE'S PANGBORN DUST COLLECTOR *which stops dust from packaging operation. At left: Close-up of packaging machine. Note special duct work for Collector.*



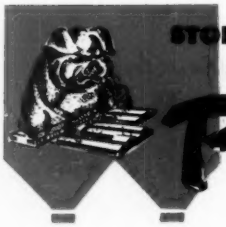
Pangborn DUST CONTROL *saves National Aluminate $14,859 a year*

$14,859... that's how much Pangborn Dust Control saves The National Aluminate Corp. of Chicago, Ill. *each year!* Chemicals, used to make NALCO products (which prevent scale formation in boilers, etc.) are recovered by five Pangborn Collectors to the tune of 3900 lbs. a day! At current prices for raw material that spells $58.50 a day, or a $14,859 profit each year. As L. A. Scheidler, plant superintendent, says: *"We couldn't operate without Pangborn Dust Control . . . the collectors have paid for themselves!"*

HOW ABOUT YOUR PLANT?

Unknown to you, dust may be costing you money. Find out . . . let us make a "dust pocket" survey of your plant at no obligation! Pangborn engineers show you how Pangborn Dust Control can save you money. For full information write for Bulletin 909A to: PANGBORN CORPORATION, 282 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning Equipment.



STOP THE DUST HOG from stealing profits with

Pangborn DUST CONTROL

tend up 2 inches between the rollers to support the die so that the sling can be removed.

Lyon-Raymond Corp., 3251 Madison St., Greene, N. Y.

•

Air Pressure Gage

Known as "Magnehelic" gage, unit is said to be sensitive to slightest air pressure changes. It is intended for use in testing filter resistance in ventilators and air conditioning equipment; measuring static pressure and air deliveries of fans and blowers; measuring air velocity from 400- to 10,000 f.p.m.; and checking operating efficiencies of dust collectors and processing systems using air.

F. W. Dwyer Mfg. Co., 317 S. Western Ave., Chicago.

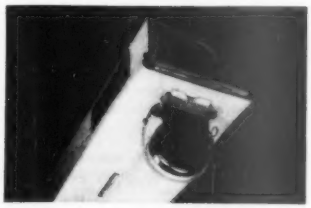
•

Drill Dispenser

Cabinet drawers are fitted with round-bottom compartments to hold different sizes of drills. Numbers or letters on drawer fronts identify contents. Drawers have positive stops to prevent spilling. Cabinets are made in three sizes, may be stacked on top of each other to save space.

Huot Mfg. Co., 550 N. Wheeler St., St. Paul 4, Minn.

•



Fluorescent Lamp Guard

Retaining spring-like device is intended to prevent the accidental fall of fluorescent lamps from open fixtures. Action is automatic; the unit is fully assembled and may be attached at the base of the lampholder.

It is made in three models, to fit all types of fluorescent installations.

Webster Electrical Co., 118 E. 28th St., New York 16.

•

Low-Water Cut-Off for Hot Water Heaters

Fuel cut-off for automatically fired boilers carrying up to 50 pounds pressure is intended to stop the burner in the event of low water which might result from leaks or other damage. Designated No. 63, it may be installed with 1-in. equalizing

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with

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STANDARD TOOLS AND BLANKS

Need cutting tools in a hurry? Just name the standard styles and carbide grades desired . . . get prompt shipment from a big stock *near* you.

Our line of carbide "standards" is complete. It covers 90% of all single-point operations. CARMET standard tools come ready to use . . . easy to modify for special purposes, by grinding. Style C, illustrated, is designed particularly for conversion into various shapes for numerous applications. Other standard CARMET styles also are immediately available from local stocks.

Order CARMET tools and blanks for better, faster, cheaper cutting. There is a grade to take care of every need.

WRITE FOR CATALOG C-2 . . . also for price list . . . great helps when you need tools fast.

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W&D 2706

Allegheny Ludlum Steel Corporation

CARBIDE ALLOYS DIVISION, Detroit 20, Michigan

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UP goes material-handling efficiency

when you use Battery Industrial Trucks

Greater efficiency in material handling means greater earning power in any plant. Start paring unnecessary moves for production hands or warehouse men and you not only reduce handling cost per unit, but make way for volume never before possible.

Battery industrial trucks are the dependable, economic means of obtaining such efficiency. They can perform their strenuous tasks 24 hours a day every day if required, and their power characteristics are outstanding: instant starting; quiet operation; no fumes; no power used during stops. Driven by electric motors, they have a minimum of wearing parts and are inherently trouble-free.

Keeping these hard-working trucks on the job calls for EDISON Nickel-Iron-Alkaline Batteries. Built of rugged steel, yet precise as a watch, they are recognized for dependability, long life and trouble-free operation. Specify EDISON and you specify maximum reliability—enduring quality.

ADVANTAGES OF EDISON NICKEL-IRON-ALKALINE BATTERIES: They're mechanically durable; electrically foolproof; quickly and easily charged; simple to maintain; not injured by standing idle.

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

EDISON STORAGE BATTERY DIVISION

of Thomas A. Edison, Incorporated, West Orange, N. J.

In Canada: International Equipment Co., Ltd., Montreal and Toronto

piping or used on automatically fired steam boilers with pressures from 20 to 50 pounds.

McDonnell & Miller, Inc., 1357 Wrigley Bldg., Chicago 11.

•

Drill Press Clamps

Designed to fit any slotted drill press table, clamps hold pieces from paper thickness up to 2½ inches. "T" design of clamping screw permits quick installation or removal. Units are claimed to hold many types of drill press work, such as jigs, angle plates, and bars, without bolts.

Dodd Products, Inc., 405 Atkins Ave., Lancaster, Pa.

•

Waterproof Switch

For use in counting bottles, cans, and other round objects, waterproof switch is suitable for actuating electric counters located wherever there is danger of splashing liquids. Switch arm is operated by a 1-in.-diam. rubber wheel, and is said to provide dependable counter actuation even though the round objects may be touching. Designated Model ES-14, switch will operate counters at speeds up to 600 counts per minute.

Production Instrument Co., 700-06 W. Jackson Blvd., Chicago 6.

•

Air-Powered Electrode Dressers

Portable electrode dresser, Model 7165, is equipped with cutter for reshaping copper electrodes on spot welding machines without removing their tips. Unit has 1200-rpm. cutting speed and weighs 3½ pounds.

All driving gears are supported on needle or ball bearings. Height of angle is ¾ inch; over-all length, 10⅝ inches.

The Aro Equipment Corp., Bryan, Ohio.

•

Expendable Pallet

Made from corrugated materials, expendable pallet may be discarded after one use. Unit supports are "logs" rolled from single-faced corrugated board. Corrugated sheets are glued to top and bottom of logs. Load is secured to pallet with glue or metal banding. Multiple package loads can be stacked.

Single corrugated container, called "Power Pack," is also available. With

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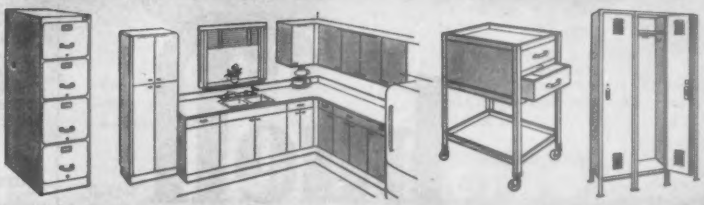
LYON METAL PRODUCTS, INCORPORATED

General Offices: 1012 Monroe Avenue, Aurora, Illinois • Branches and Dealers in All Principal Cities



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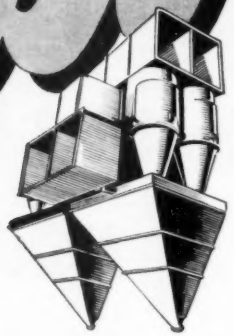
• Wood Working Benches	• Hanging Cabinets	• Folding Chairs	• Work Benches	• Bar Racks	• Hopper Bins	• Desks	• Sorting Files
• Economy Locker Racks	• Welding Benches	• Drawing Tables	• Drawer Units	• Bin Units	• Parts Cases	• Stools	• Revolving Bins

The Straight-line Approach to Recovering

VALUABLE dust



no blind alleys

if you recognize the problem for what it is, an engineering job for specialists. True, when it comes to equipment, Buell's exclusive van Tongeren 'Shave-Off' gives the Buell Cyclone System unique advantage. But in the fundamental engineering, in the analysis of your dust into its fractional components of graded micron sizes, and in the sizing of equipment for maximum performance—at this stage Buell engineering service is invaluable. No cost or obligation is involved . . . because we build only tailored-to-measure installations, we sell by engineering the job from the ground up. Let us send you our 32-page brochure, 'Engineered Efficiency', as a general introduction. Write: Buell Engineering Co., 70 Pine Street, Suite 5020, New York 5, N. Y.

buell

Engineered Efficiency in

DUST RECOVERY

Manufacturing in the United States and Canada for shipment throughout North and South America.

64-cu.ft. volume, each unit carries loads up to 4000 pounds.

Robert Gair Co., Inc., 155 E. 44th St., New York 17.

•

Metal Windows

Mechanically operated metal louver windows are said to afford control of ventilation in both good and inclement weather, with no direct air currents. They are made to accommodate insulating glass, have provisions for metal insect screens, and are available with both direct and remote control.

The Stewart Iron Works Co., Box 1039, Cincinnati 1, O.

•

Gas and Liquid Analyzer

Called Luft-Type Infra-Red Analyzer (LIRA), device is intended for use in measuring atmospheric contaminations and for process control. It is said to detect minute as well as heavy concentrations of contaminates. It may be made selective so as to measure one specific product in the presence of several.

The Mine Safety Appliances Co., Braddock, Thomas, & Meade Sts., Pittsburgh 8.

•

Portable Power Supply

Lightweight power supply is capable of providing a regulated source of direct current at loads from 200 to 300 milliamperes. It may be used either as a portable or a rack-mounted unit. Designated Type TY-25A, it is adjustable between 260 and 290 volts, with variations of less than 0.5 per cent from minimum to maximum load. A.c. ripple is said to be less than 0.01 per cent from peak to peak. Power requirement is 120 volts, 60 cycles, 300 watts.

Radio Corporation of America, RCA Victor Div., Camden, N.J.

•

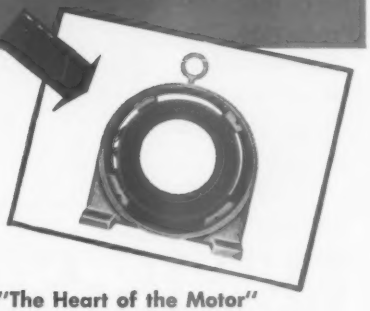
Hose

High-strength flexible hose for handling kerosene, fuel oil, and other petroleum distillates, is constructed with a braided rayon reinforcement over buna N synthetic rubber. It has two-stranded annealed copper wires for the dissipation of static electricity. Neoprene cover withstands

Look at the WINDINGS and See for Yourself...

ELECTRO DYNAMIC MOTORS

are stout-hearted motors!



ELECTRO DYNAMIC INDUSTRIAL MOTORS are built in a wide range of types and sizes . . . 1 to 250 H.P. Shown above is an E.D. Drip Proof Industrial Motor. For use under ordinary industrial conditions not requiring protection from splashing liquids or from atmosphere laden with dirt or metal chips.

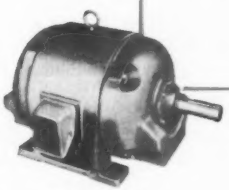
Extra Care at "The Heart of the Motor" Assures You Longer Service, Greater Operating Dependability

Every E.D. industrial motor receives specialized attention at the windings —"the heart of the motor." This extra care and superior insulation materials give Electro Dynamic motors the *plus qualities* of great reliability and long life.

E.D. motors have long been known for staunch dependability in the toughest of all power installations—aboard great ships at sea, under unbelievably severe operating conditions. Now the fine craftsmanship and sturdy construction features of these famous E.D. marine units have been incorporated in a versatile new line of E.D. *industrial* motors, designed to bring to *your* electric power installations the same stamina and trouble-free performance that have characterized E.D. products since 1880.

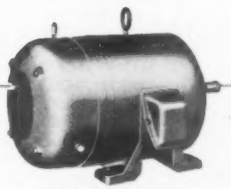
Get the facts on Electro Dynamic industrial motors. You'll be amazed that such rugged, carefully made motors can be *competitively priced!* Write today for illustrated literature.

Other Types of ELECTRO DYNAMIC Industrial Motors



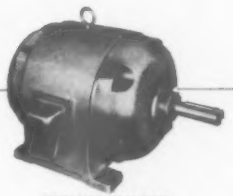
SPLASH PROOF

For installation where the motor is subjected to splashing liquid or hosing down for cleaning.



TOTALLY INCLOSED (Fan-Cooled)

For dirt-laden atmospheres, especially where the installation requires a motor of compact dimensions.



TOTALLY INCLOSED (Non-Ventilated)

For use in exceptionally dirty atmospheres, particularly when metallic dust is present.

Also a Complete Line of DIRECT CURRENT Motors and Generators. Literature on Request.

Industry is learning what marine engineers have known since 1880

ELECTRO DYNAMIC makes great motors

ELECTRO DYNAMIC • Division of the Electric Boat Company • Bayonne, N. J.

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IS STRAIGHT LINE THINKING

SAVES YOU MONEY

Floor Space
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Ceiling Space
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Production Time
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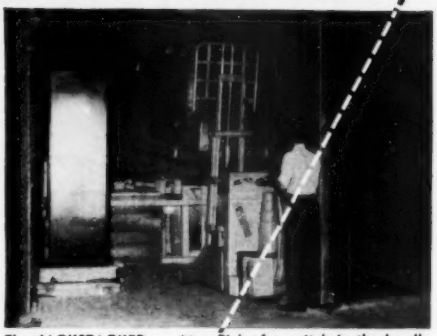
and pays
for itself
in "Jig Time"



The JACKSTACKER — At a flick of a switch in the handle head this combined electric lift truck and stacker lifts and lowers as it hauls — fits in where heavy fork trucks fail. 5 different models, telescopic and non-telescopic. Caps. to 4000 lbs. Photo shows Counterbalanced, Tilting Model, 3000 lbs. cap. in freight car. Hundreds of other cost-cutting uses for this latest unit in the "MASTER" Line.

LEWIS-SHEPARD®
MATERIALS HANDLING EQUIPMENT
"Engineered to Save You Money"

Volume Off? Costs up? Competition Swift? What to do? . . . Lick them with the "Master" Line! Multiply your manpower, storage space, floor space! Speed up receiving, production, storing and shipping!

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SPACEMASTER Gas Trucks (Fork Types)
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JACKLIFT ELECTRIC Trucks
MASTER JACKTRACTORS
MASTER JACKLIFT Trucks
MASTER QUICKLIFT Trucks
MASTER REDILIFT Trucks
MASTER SPEEDLIFT Trucks
POWERMASTER Stackers
SPEEDMASTER Stackers
FLOORMASTER Trucks
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PLEASE SEND ME your new 16 page Bulletin on the two latest units in the "Master" Line.

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cold temperatures, scuffing, and abrasion.

Called Peerless Fuel Oil-Distillate hose, it is available in 1- and 1¼-in. sizes, 1½-in. I.D.

United States Rubber Co., Rockefeller Center, New York 20.

•

Variable Speed Control

Speed control device, which is infinitely variable from zero to maximum, is a torque conversion structure. Called the Zero-Max, its operating principle involves the use of a crank motion on the input shaft creating linear motion. This is absorbed on the output shaft by a series of one-way overriding clutches. Leverage mechanism between the two shaft structures varies the length of stroke from zero to 4 to 1 ratio.

Unit will handle loads up to 10 inch-pounds output torque. Its dimensions are 4x2¾x1¼ inches.

Revco Inc., Dept FMM, 405 Thorpe Bldg., Minneapolis.

•

Measuring Device on Wheels

For making building and land measurements, Shalda Measure-Meter will add, substract, and measure curves. It is claimed to be accurate to plus or minus 1/10 of 1 per cent, registers up to 10,000 feet and fractions. It adds or substracts by pushing or pulling, and can be reset to zero at any time. It can be run up walls to simplify cubic measurements.

F. D. McGirr & Associates, 145 S. Elm Dr., Beverly Hills, Calif.

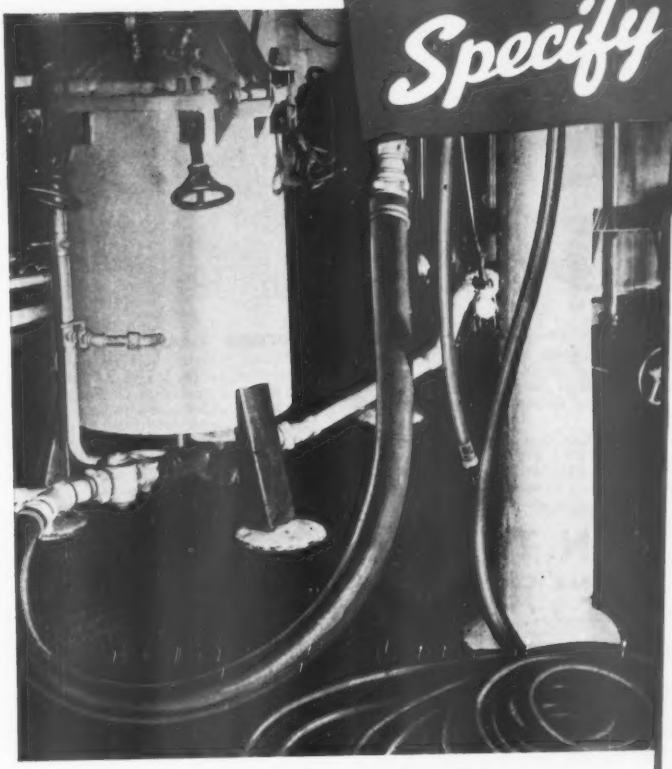
•

Portable Hopper Thawing Tube

Frozen hoppers may be thawed out with portable tube device which burns kerosene or light furnace oil. Torch flame is claimed to generate smokeless heat of 2000-deg. F. with fuel consumption of 3½ gallons per hour. No compressed air is needed.

In use, the tube is slid under the

Specify Thermoid



The Thermoid Impregnation Process insures a deeper penetration of rubber between the threads of the yarn, which encases each individual strand with protective rubber. The rubber acts as a sheath between the strands and prevents the destructive abrasive action as the product is flexed in use. To obtain the required rubber penetration, the twist of the yarn must be to exact specifications. With the yarn twisted too tightly, proper penetration of the rubber compound is impossible. This condition produces abrasion, causing premature failure. On the other hand, if the yarn is twisted too loosely, the product lacks tensile strength. Thermoid has discovered the optimum twist of the yarn which assures maximum rubber penetration and greatest strength. The development of Thermoid Impregnation Process is another step forward in Thermoid's planned program of product improvement, assuring maximum service and lower operating costs to industry through the use of Thermoid Industrial Rubber Products.

Versicon Hose Cuts Costs

Now available . . . a multi-purpose hose designed for superior performance with virtually any liquid or gas . . . Thermoid Versicon Hose. It is made with neoprene tube and oil-resistant cover—with high tensile rayon cords to insure maximum strength, light-weight and flexibility.

Versicon, another of the famous quality rubber products made available to industry through Thermoid research, is the answer to a long felt need. Now your nearest Thermoid distributors can supply you with *one hose* for your requirements. Now you can cut your costs and reduce inventory. Versicon eliminates the need for special hose . . . Versicon *is* the special hose. Available from 3/16" to 2½" for use with air, water, oil, gases and virtually all fluids in lengths from 50′ to 500′ depending on size.

It will pay you to ***Specify*** Thermoid!

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

Main Offices and Factory • Trenton, N. J., U. S. A.

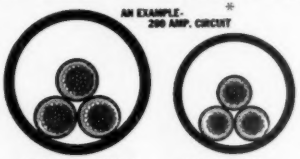
Western Offices and Factory • Nephi, Utah, U.S.A.

Industrial Rubber Products • Friction Materials • Oil Field Products

CRESCENT

ENDURITE-Type RH

Gives Greater Current Carrying Capacity per Dollar of Installed Cost



250,000 CM TYPE R
Requires 2½" Conduit. Maximum permissible operating temperature 60°C.

3/0 TYPE RH
Requires 2" Conduit. Maximum permissible operating temperature 75°C.

The superior heat resistant characteristics of CRESCENT ENDURITE INSULATION with its higher permissible operating temperature and therefore greater current carrying capacity, permit the use of a smaller size of conductor, and in most cases smaller size of conduit at less cost than would be required for Type R Wire for the same load.

For light loads requiring small sized conductors, Voltage Drop is the determining factor in choice of wire size. Usually in sizes No. 6 AWG and heavier for power circuits or No. 1 AWG and heavier for lighting circuits, CRESCENT ENDURITE TYPE RH Wire & Cable gives the lowest installed cost-per-ampere of useful circuit capacity.

In accordance with 1947 National Electrical Code

CRESCENT
INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY

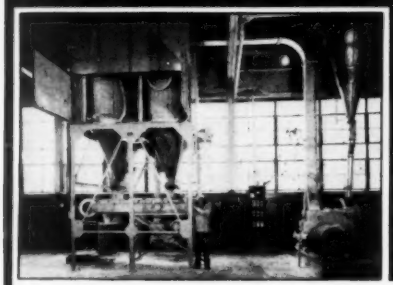
OVER 60 YEARS EXPERIENCE

WHEN YOU USE A MIKRO

***You Will Find That You--* SAVE —Motor Power**

SAVE —Manpower

SAVE —Material



Installation of 4-Bag MIKRO-COLLECTOR (left) as auxiliary to No. 8 MIKRO-ATOMIZER (right). Atomizer grinds 2000 lbs. of a plastic material per hour to an average fineness of 5 microns. Collector handles 3600 c.f.m.*

Let us show you how others have effected economies and improved their finished product through the use of MIKRO grinding and dust collecting equipment specially designed for the Process Industries.

WRITE TODAY—for our new illustrated catalog and information regarding our uncharged-for laboratory service to help you solve your pulverizing and dust collection problems.

*Patents applied for by H. J. Hersey, Jr. and Pulverizing Machinery Company.

PULVERIZING MACHINERY COMPANY
24 Chatham Road Summit, New Jersey

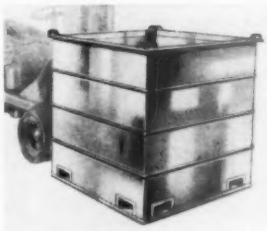
PRESERVE OUR HERITAGE: FAITH, FREEDOM and INCENTIVE

MIKRO-COLLECTOR
Reg. U. S. Pat. Off.
By the makers of
MIKRO-PULVERIZERS and MIKRO-ATOMIZERS

hopper door, and lighted burner is set in the tube opening. Burner has a removable regulating valve with strainer and union.

Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15.

•



Storage Box

Utility storage box may be used with fork-lift tractors, overhead cranes, and hand-operated pallet bed trucks. Features include 4-side utility, self-positioning stacking lugs, four corner lifting hooks. Constructed of 12-gage steel, all joints are welded. Over-all size is 4x4x4 feet, capacity, 64 cubic feet.

North American Industries, Inc. 2100 N. Kolmar Ave., Chicago 39.

•

Welding Control

Low-frequency welding control is designed to draw power from a 3-phase line, convert it to a lower frequency single phase, and supply it to the electrodes of a resistance welder.

Unit can be mounted on the floor or on the side of the machine. A swing-out panel provides access to all components and circuits.

Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

•

Nonslip Floor Wax

Said to combine high luster with strong friction-grip, floor wax, called Anti-Slip, is suitable for use on all floor surfaces. It is nonflammable, and contains no solvents.

The Penetone Co. Tenafly, N.J.

•

Anti-Vibration Mount

Called "Finnflex CM-H", mount isolates machinery vibration, accord

New edition of Catalog 899—just off the press—latest additions to CP line of UNIVERSAL ELECTRIC TOOLS—designed and built for the production line—and low maintenance.

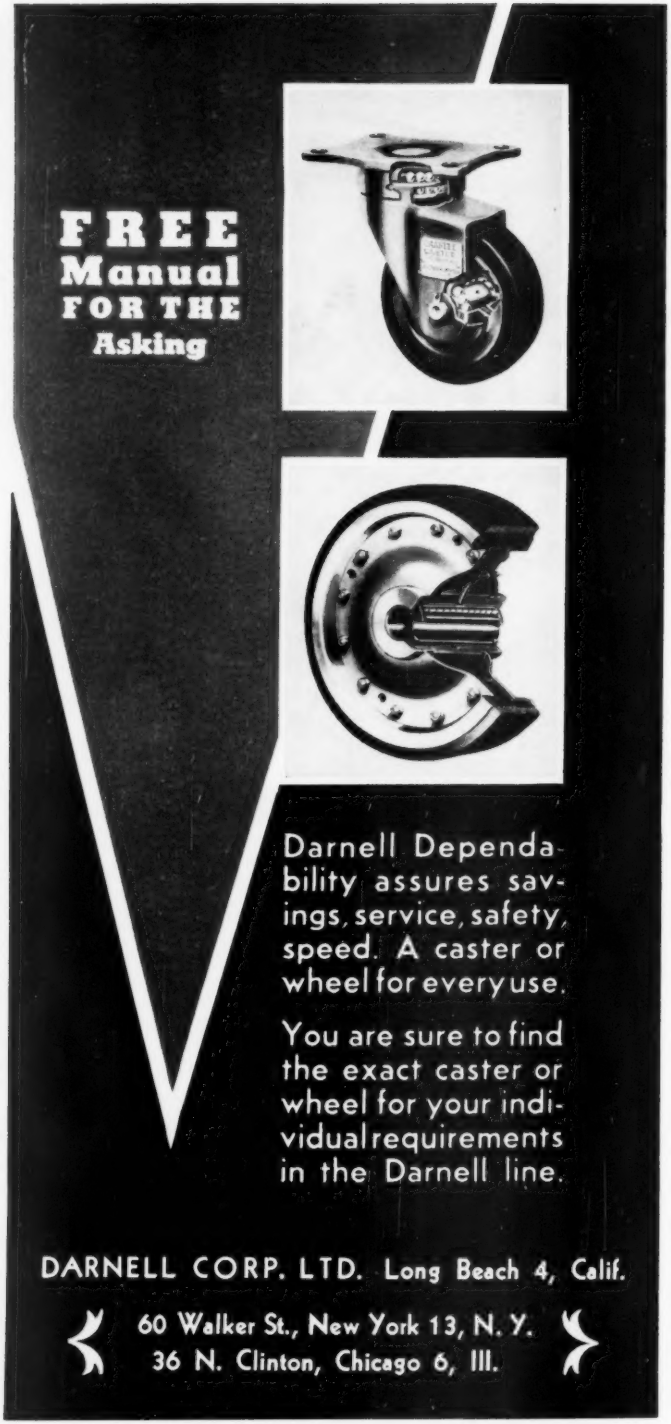
Illustrated and presented in a new format for quick reference—is the complete line of CP Universal Electric Tools and accessories.

Write for a copy of Catalog 899-5

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

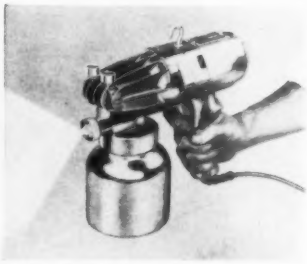
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES


FREE
Manual
FOR THE
Asking
Darnell Dependability assures savings, service, safety, speed. A caster or wheel for every use.
You are sure to find the exact caster or wheel for your individual requirements in the Darnell line.
DARNELL CORP. LTD. Long Beach 4, Calif.
60 Walker St., New York 13, N. Y.
36 N. Clinton, Chicago 6, Ill.

ing to manufacturer. Vibration and noise are claimed to be reduced by steel channel floated in rubber between two steel angles. Unit is designed for uniform deflection and load ranges from 600 to 1000 pounds. Over-all height is 2 inches.

Finn & Co., 2850 Eighth Ave., New York 30.

•



Portable Spray Kit

Spray-gun kit, called Payswell Spray-pak, weighs less than 17 pounds, including the gun. Spray gun is self-contained, with compressor, motor, and gun all in one unit. It is claimed to spray one quart of paint, or any sprayable liquid, in four minutes at more than 50 pounds air pressure.

Sellco Corp., Dept Z-88, 801 Andrus Bldg., Minneapolis 2.

•

Tube Fitting

For use with metal or plastic tubing, fitting, called "Swagelok," is designed to give leakproof seals at three points. Two ferrules and threaded chuck which clamp around tube are said to have almost no effect on inner walls. Axial support by unit tends to drive vibration away from the device, which fits onto end of tube and is tightened by 1¼ turns.

Available in monel, aluminum, steel, and stainless steel. Connectors, unions, elbows, and tees can be used with tubing ⅛- to 1-in. O.D.

Crawford Fitting Co., Cleveland 17.

•

Cold Solder

Called Lab-Metal, solder goes on cold, can be applied with putty knife or rubber squeegee. It fills blow holes, sand holes, surface blemishes, and rough or porous places in castings and other metal surfaces.

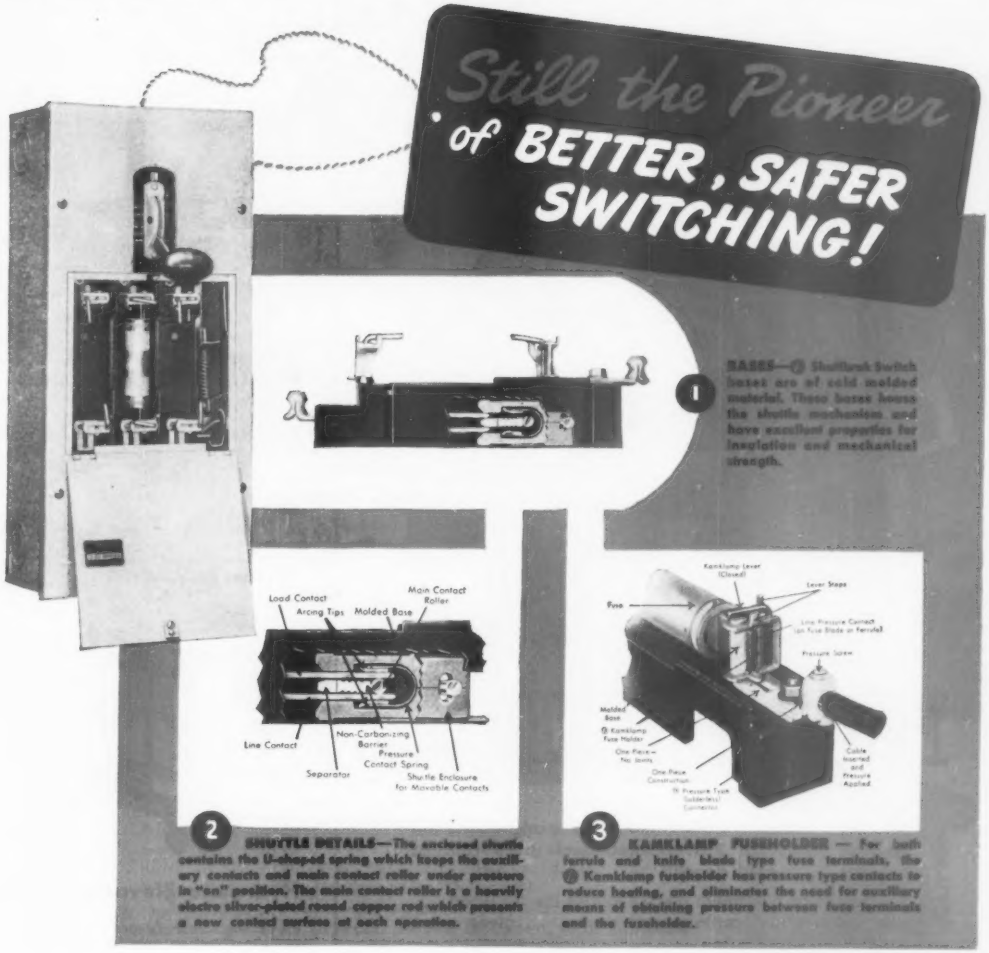
Alvin Products, Inc., 20-22 Houghton St., Worcester 4, Mass.

•

Photoelectric Control

High-speed photoelectric control, Type 23LF3, was developed to maintain an accurate register of paper

A Time-Tested Switch that's...


Still the Pioneer
of BETTER, SAFER SWITCHING!
1
BASES—Ⓕ Shutlbrak Switch bases are of cold molded material. These bases house the shuttle mechanism and have excellent properties for insulation and mechanical strength.
Load Contact
Arcing Tips
Molded Base
Main Contact Roller
Line Contact
Non-Carbonizing Barrier
Pressure Contact Spring
Separator
Shuttle Enclosure for Movable Contacts
2
SHUTTLE DETAILS—The enclosed shuttle contains the U-shaped spring which keeps the auxiliary contacts and main contact roller under pressure in "on" position. The main contact roller is a heavily electro silver-plated round copper rod which presents a new contact surface at each operation.
Fuse
Lever Stops
Pressure Screw
Molded Base
Cable Inserted and Pressure Applied
3
KAMKLAMP FUSEHOLDER — For both ferrule and knife blade type fuse terminals, the Ⓕ Kamklamp fuseholder has pressure type contacts to reduce heating, and eliminates the need for auxiliary means of obtaining pressure between fuse terminals and the fuseholder.

SHUTTLE MOVEMENT, the still-new but time-tested feature found only in Ⓕ Shutlbrak Switches, continues to provide safer, sounder switching for industry.

Ⓕ Shutlbrak Switches embody the latest in design and construction . . . with such features as a barrier between the line and load contacts that *resists arcing* at all times . . . quick make and break connections . . . and heavily silver-plated copper contacts which actually improve with use.

It's an ideal switch for motor control, for service entrance, for any industrial job that demands safe and dependable switching. And, of course, it is approved by Underwriters' Laboratories.

Write for Bulletin No. 501 or see your nearest Ⓕ Representative (he's listed in Sweet's).

FA TRADE MARK

Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

Reduce your

maintenance worries... Use

PENTA-TREATED wood

Men who handle maintenance budgets appreciate the positive protection PENTAchlorophenol gives against termites and wood decay.

This scientific treatment means longer life for wood . . . cuts upkeep and replacement costs . . . gives wood greater salvage value.

Widely used in home, farm and industrial construction, PENTAchlorophenol is rapidly expanding the already great usefulness of wood as an economical building material. "PENTA"-treated lumber is clean and easy to handle—paintable, too, when the proper solvent is used.

Safeguard your wood construction —and your budget—specify "PENTA"-treated lumber. For further information, write Dow, Dept. PE 28.

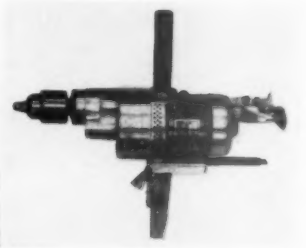
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

DOW penta- chlorophenol

and cellophane sheets being cut for bags and wrappers. It may also be used for inspection applications, to detect seams or blemishes in textile sheeting material, and to inspect for proper labeling.

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

•



Two-Speed Electric Drill

Designed for high- and low-speed work in steel or hardwood, two-speed drill has gear shift arrangement which extends use of drill from $\frac{1}{4}$ to $\frac{5}{8}$ inches in steel and $\frac{1}{4}$ to $1\frac{1}{4}$ inches in hardwood. With three drill settings (high-neutral-low), operator can shift while motor is operating. In lower range, speed is 460 rpm.; in fast range, 880.

Louisville Electric Mfg. Co., 3008 Magazine St., Louisville, Ky.

•

Hydraulic Elevating Table

Constructed of steel, hydraulic elevating table is portable but can remain fixed in any position. Its hydraulic jack, which raises one-quarter inch per stroke, is removable. It will load up to 750 pounds. Table top measures 28x19 inches. Minimum height from floor to table is 27 inches; maximum, 42 inches.

Montgomery & Co., Inc., 53 Park Place, New York 7.

•

Insulator

For insulation of steam and water coils, insulator also will protect plating tanks from grounds and shorts. It is built with male-threaded fittings on each end of a hexagon-

Job File No. 1949

MALLEABLE NUT PRODUCTION *Fully Automatic* CONTROLLED BY T-J CYLINDERS

All moving parts are controlled hydraulically by T-J Cylinders —on this Malleable Nut Production Machine designed and built by Roy Hays & Associates, Rockford, Ill., for the Wagner Malleable Products Co., Decatur, Ill.

It's *fully automatic*—the operator only places nuts in stations. Nine T-J Cylinders, 40 ton to ½ ton, help complete the job of cutting off sprue, sizing, boring, facing, chamfering and threading 2,500-¾ std. pipe thread nuts per hour.

For your tough jobs of power movement —pushing, pulling or lifting—*save labor, speed production* and *cut costs* with T-J Air and Hydraulic Cylinders! Many standard sizes and styles . . . both cushioned and non-cushioned types . . . 100 lb. or 50,000 lb. Precision-built for long-life dependability. Write for latest catalogs. The Tomkins-Johnson Co., Jackson, Michigan.

FOR POWER MOVEMENT IN ANY DIRECTION

100 LB. or 50,000 LB.

32 YEARS EXPERIENCE

T-J

TOMKINS-JOHNSON

RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHOR

Now! for the first time

AN EFFICIENT SELF-PRIMING CENTRIFUGAL PUMP

SUITABLE FOR MANY INDUSTRIAL REQUIREMENTS

GORMAN-RUPP'S IMPROVED DESIGN brings self-priming to its highest stage of development — no valves, no vents, no mechanical devices — no foot valve as in conventional centrifugal pumps.

CAPACITIES 50 TO 1200 GPM ASK FOR BULLETIN 8IP-11

THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

Finest Lather Dispenser..
at the Lowest Price!

Durable and trouble-free. Simplest lather mechanism ever built. Can't leak! Can't drip!

Shatterproof Lustrex container. Contents are always visible.

Hood is highly polished stainless steel.

Attaches to hard surface walls with or without screws.

Distributed throughout U.S. and Canada. Send for name of local dealer.

SELLS FOR 20% LESS THAN ANY OTHER QUALITY LATHER DISPENSER

Write for Free Demonstration.

Bobrick MANUFACTURING CORPORATION
★ 1214 Nostrand Avenue, Brooklyn 25, New York
★ 1839 Blake Avenue, Los Angeles 26, California

shaped coupling. Rayon-braid steam hose, covered inside and out with rubber, is sufficiently flexible to permit attachment even on connections which are slightly out of line, according to the maker. Device may be used on any steam line with up to 40 pounds steam pressure or 125 pounds water pressure.

True Brite Chemical Products Co., Box 31T, Oakville, Conn.

•

Air Break Contactor

High-voltage air break contactor, Type 256, measures 15x25x38 inches. Double break contacts are said to have arc voltage and double rate of dielectric recovery. These, together with vertical, direct-action, solenoid type magnet, eliminate need for flexible leads, turning shaft, and shaft bearings.

Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1.

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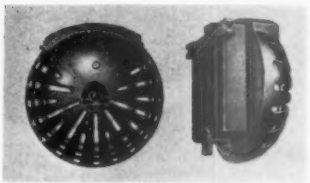


Alarm Bell

For either single-stroke or vibrating operation, bell is designed to stand up under long service with minimum of maintenance. Unit contains solenoid coil in which loose-fitting plunger operates. Mechanism is supported by glazed porcelain terminal block mounted in cast aluminum back box. Available in 8-, 10-, and 12-in. sizes for operation on 3-250 volts, a.c. or d.c.

The Autocall Co., Shelby, Ohio.

•

Ratchet Screwdriver Kit

Pocket kit for offset ratchet screwdriver, No. 3600, contains a handle and seven key adapters. Sizes range from 5/64 to 5/16-in.

North Bros. Mfg. Co., Div. of Stanley Tools, 2732 N. Philip St., Philadelphia.

•

Glass Cleaner

Cleaning and polishing cloth is claimed to prevent formation of steam and mist on glass surfaces. Called Kleeroid, product forms protective film that lasts from 24 to 72 hours, according to manufacturer, and helps eliminate glare and retard

UNIT HEATING...
its uses and advantages

Where it is used Unit heating is widely used in industrial plants and warehouses, garages, stores and public buildings where the following advantages are important.

Low first cost Unit heaters are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost. Additional savings are effected because the system requires a proportionately smaller amount of pipe, fittings and accessories.

Economy of operation Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Heat is turned on and off merely by throwing a switch either manually or automatically by simple thermostatic controls. The rapid response means that heat is furnished only when and where it is wanted . . . no heat is wasted.

Heating comfort Unit heaters provide quick heating from a cold start. Desired temperatures are easily maintained within a close range. Heat is uniformly distributed in the working zone by forced air circulation. It is a very flexible system because different or changing heating requirements are easily satisfied by means of different models, a range of capacities, single- or two-speed motors and individual thermostatic controls.

Adaptability to equipment and floor layout The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in plant layout or heating requirements.

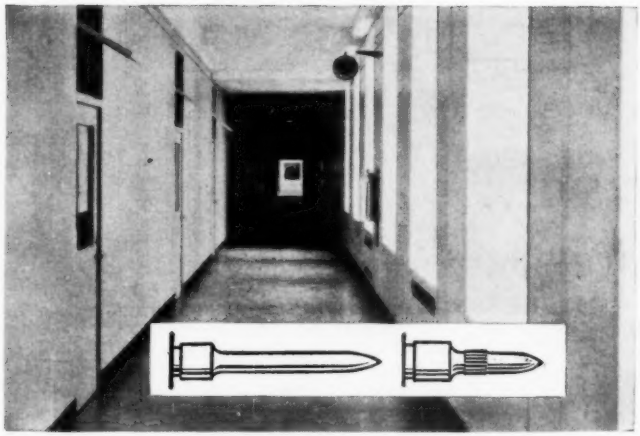
Thermolier unit heaters have important construction advantages The design of Thermolier unit heaters is the product of Grinnell Company's ninety-nine years of heating experience. Those responsible for heating like Thermolier's durability, freedom from maintenance troubles and dependable operation. Typical of its construction features is the patented internal cooling leg which permits the use of a plain thermostatic trap, the simplest, least expensive kind of trap. For full details on Thermolier features, capacities and types, send for Thermolier Catalog.

THERMOLIER
Unit Heaters

99 YEARS PIPING

GRINNELL

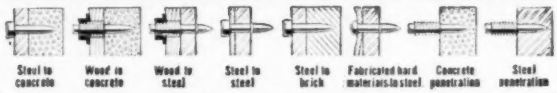
Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane



35,000 *Ramset* fasteners cut costs in this building

Substantial cost savings and more rapid completion of the work resulted from the use of RAMSET FASTENING SYSTEM in this large building at Silver Springs, Maryland. Metal channels were fastened to concrete ceilings and floors with the light, portable RAMSET TOOL, using 35,000 RAMSET FASTENERS as illustrated. Each fastening took less than a minute working time—much faster and far less costly than old-fashioned drilling and chipping.

RAMSET SAVES TIME AND MONEY ON MOST FASTENING JOBS



Requiring no air, electric or other external power, because it is self-powered, the RAMSET TOOL is simple and easy to operate and can be used in small, confined spaces. In an hour, we teach any good workman to be a competent *"Ramsetter"*, able to do a wide variety of fastening jobs quickly and competently.

COMPARE "RAMSETTING" WITH YOUR PRESENT COSTS

Let us give you a 15-minute demonstration of the RAMSET SYSTEM —and prove with facts and figures how it will save you 50% or more in your fastening work. Just mail the coupon. *Stemco Corporation, Cleveland 16, Ohio.*

MAIL THIS COUPON PM

Stemco Corporation,
Cleveland 16, Ohio

Please demonstrate with facts and figures how I can make a profit with RAMSET FASTENING SYSTEM.

Name _____

Address _____

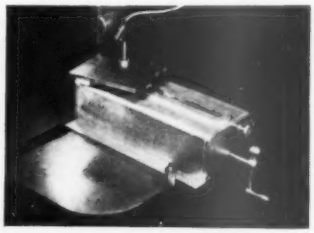
City _____

adherence of dust and dirt.

Smaller cloth, called Kleerize, is for use with eyeglasses.

Lee Products, Inc., 424 Walnut St., Philadelphia 6.

•



Band Saw Fixtures

Automatic attachment for band saw permits circle feed from 5- to 18-in. diameters and up to 2 inches in thickness. Feed is driven by spring motor. Gears are enclosed to protect against dirt and steel cuttings. Attachment will run for 5 minutes and stop automatically when piece is cut.

Columbus Special Machine Co., Columbus, Ohio.

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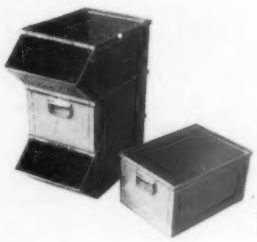

Tote Boxes

For individual use or interchangeable with hopper-front bins, straight-sided tote boxes are intended to provide protection, accessible storage, and means of transportation between processing points. Stacking rims allow rigid nesting on floor or bench. Made of welded steel with drop handles, 7 sizes range from 3½x6x 3¼ to 15x24x11 inches, with special sizes made to order.

Stackbin Corp., 1129 Main St., Pawtucket, R. I.

•

Portable Electric Finisher

Smooth operation and straight-line sanding, rubbing, and polishing are claimed features of portable electric finisher, Model DF. Rear handle is designed for one-hand operation. Attachable front guide handle is furnished for use on overhead work and other jobs where two hands are needed.

Detroit Surfacing Machine Co., 7433 W. Davison, Detroit 4.

•

Collapsible Steel Box

Sides of collapsible steel box are locked in position by pin and slide

WRIGHT EQUIPMENT is used in many new buildings at Caterpillar Tractor Co., Peoria, Illinois. Shown here are 3 of 10 Wright Speedway No. 2 Frame Electric Hoists on one of "Caterpillar's" scraper assembly lines.

WHERE BUYERS ARE "CHOOSY" THE CHOICE IS

WRIGHT

We like to do business

with the type of buyer who's "from Missouri"— who makes his own performance tests on the job—whose idea of value is based solidly on such tests.

Send for your copy of the descriptive folder DH-65. Your nearby Wright Distributor or Wright District Office can supply you. Or write direct to us in York, Pa.

ACCO

York, Pa. · Chicago · Denver · Detroit · Los Angeles · New York
Philadelphia · Pittsburgh · Portland · San Francisco · Bridgeport, Conn.

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Canada: UPTON, BRADEEN & JAMES LTD., Montreal, Toronto, Vancouver, Windsor, Winnipeg

HOISTS TROLLEYS CRANES

NOW for a better fit, more comfort, longer wear
NEW, IMPROVED
NEOPRENE HOOD INDUSTRIAL
CURVED-FINGER GLOVES!

New Hood gauntlets and knit wrists provide new *comfort*, better *fit*, longer *wear* for *vital* hands. In addition, there's ample knuckle allowance, curved fingers and thumbs, reinforced thumb crotch, no seams on working surface, *color fast* knit wrists. Be sure of new protection, new efficiency. Order from your jobber today!

HOOD for Safety plus
HOOD RUBBER CO.
Watertown, Mass.
DIVISION OF THE B. F. GOODRICH CO.

Don't spoil it-
KROIL it!

Don't ruin a valuable piece of equipment merely because some part is rusted tight. Apply Kroil, the amazing new chemical lubricant that creeps into millionth inch spaces (proved by laboratory tests), dissolves rust, supplies necessary lubrication and
LOOSENS FROZEN PARTS
5000 of America's leading plants can't be wrong! They used KROIL during the war and are still depending on it to save expensive labor and valuable parts. They say; "Kroil loosened bushings after a 12 ton press had failed" . . . "on repairing heat treat trolleys formerly destroyed every nut. Now Kroil saves them all, and time too" . . . You, too, should be using KROIL every day. Try it on a money back basis. Gallon $3.50. 5 Gals., $13.75 F.O.B. Chicago.
Jobbers—Ask for discount schedule.
KANO LABORATORIES
67 E. WACKER DR., CHICAGO 1, ILL.

bolt arrangement. Designed for handling by platform or fork truck, the box is made in various widths, lengths, and heights.

Box can be tiered, loaded or empty, when set up. It can be equipped for crane handling, and is designed for either two- or four-way truck entry.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland 4.

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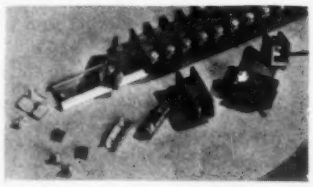

Sectional Terminal Blocks

Sectional terminal blocks of the single-circuit type can be assembled into strips of any length from one to 75 pairs. Blocks are of molded Melamine for high dielectric strength.

Available in 25- and 50-amp. sizes, they are suitable for any voltage up to 600 volts, a.c. or d.c. The 25-amp blocks will accommodate conductors as large as No. 10 solid copper wire, the 50-amp, No. 4 stranded cable.

Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

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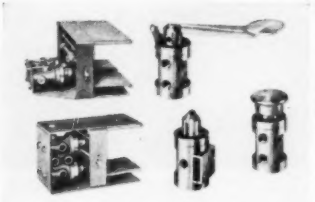

Pilot Valves

For direct control of small cylinders or automatic control of large cylinders pilot valves are available in cam, lever, push-button, or foot-operated types. All are 3-way except foot-operated units, which are 4-way.

Hanna Engineering Works, 1765 Elston Ave., Chicago 22.

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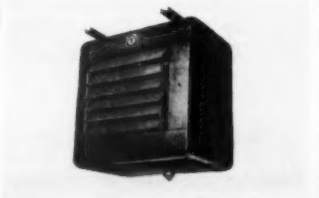


Unit Heaters

Line of unit heaters includes nine sizes with capacities ranging from 100 to 1000 E.D.R. Heat transfer surface is constructed of electro-tin plated copper tubes with aluminum

ROTABINS BRING PARTS TO YOU

SAVE SPACE-SAVE TIME SAVE MONEY

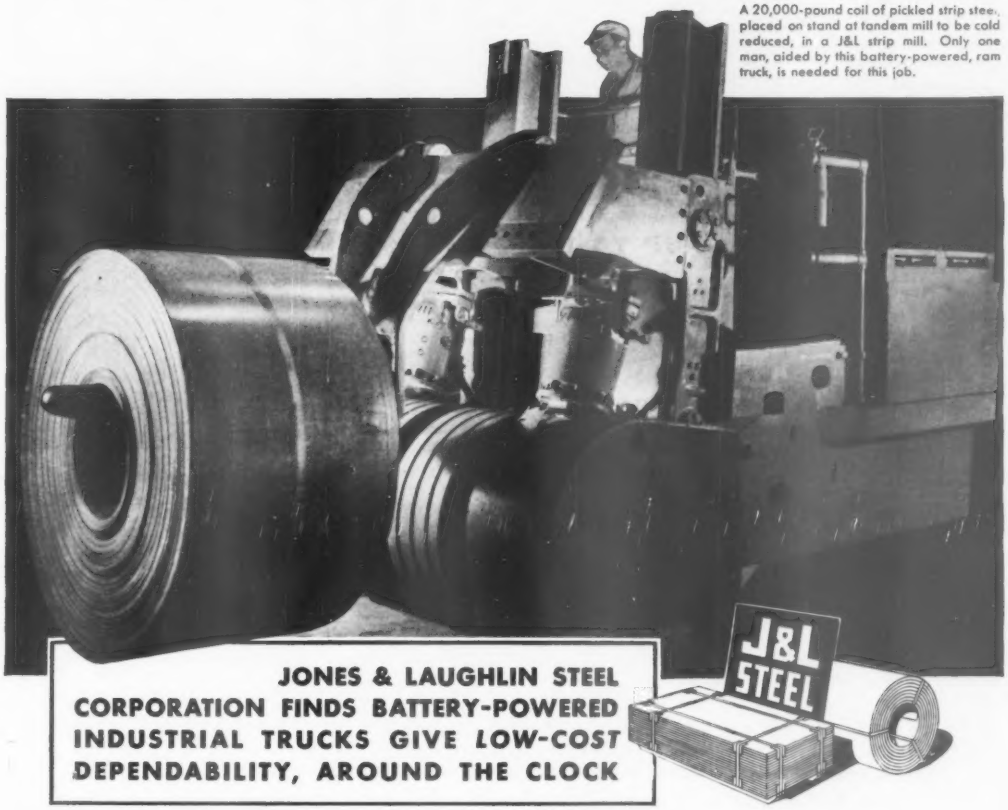
RB-3440: 34" diameter, 65½" high, has 8 separately rotating sections, 6¾" high, with 5 compartments 21" wide at face.

Compartments are punched on 1" centers for additional dividers. Bin fronts are removable to permit use of drawer units or pans. Only $84.00 f.o.b. Wellston, Ohio.

Send for new, illustrated circular J-214:
The Frick-Gallagher Mfg. Co.
Sales: 411 Shubert Bldg., Phila. 2, Pa.

FGM FRICK-GALLAGHER
WELLSTON, OHIO
SHELVING • PARTS BINS • ROTABINS
COUNTERS • RACKS • TABLES

27¢ per truck-hour covers *all powering costs* for these 15-ton electric trucks



A 20,000-pound coil of pickled strip steel, placed on stand at tandem mill to be cold reduced, in a J&L strip mill. Only one man, aided by this battery-powered, ram truck, is needed for this job.

JONES & LAUGHLIN STEEL CORPORATION FINDS BATTERY-POWERED INDUSTRIAL TRUCKS GIVE *LOW-COST* DEPENDABILITY, AROUND THE CLOCK

At its Second Avenue plant, Pittsburgh, Pennsylvania, J&L uses sixteen battery-powered ram and fork trucks to lift, move and place great coils of strip steel or "flats" of sheet and plate weighing up to 30,000 lbs. Introduction of electric trucks assured orderly, dependable transfer, on a 20-hour schedule, of material through the various operations such as hot strip rolling to annealing and pickling, pickling to cold rolling, with handling service for temporary storage between operations.

J&L accrues, in a special reserve account, all charges for power metered to the charging station, all labor and equipment for servicing and charging batteries, all battery replacements. Such accruals have been 27 *cents at most, per truck-hour*. This reserve has always been adequate to cover *all* cost of powering the trucks.

Another example of why cost-probing management looks at the *cost per unit moved*, rather than initial investment, in determining its purchase of handling equipment. And another reason why, more and more, "America's Top Industries Prefer *Battery-Powered* Trucks!"

THE ELECTRIC INDUSTRIAL TRUCK ASSOCIATION

3701-F NORTH BROAD STREET • PHILADELPHIA 40, PA.

Really Portable!

Cut your costs this EASY way! Why pay for wasteful old-fashioned "brute-strength" methods when the NEW Gee-Vee-Line Conveyors are so economical! Make them standard equipment and watch YOUR Materials Handling costs . . . go down! It's worth it!

WEIGH ONLY 26 POUNDS

Designed to meet the demand for flexibility-in-use as a materials handling aid . . . indoors, outdoors, on assembly line or delivery line . . . in factory, warehouse, store or trucking fleet. No need to pamper them—they're tough and practically maintenance proof. Standard 10-foot sections WEIGH ONLY 26 POUNDS and

HANDLE UP TO 150 POUNDS

Available in five- and ten-foot straight sections and 90-degree curve sections, all with built-in couplers. 5 sizes of tripod supports. Immediate shipment. Write for details today.

HASLETT CHUTE AND CONVEYOR CO., Oaks, Pa.

Don't cut your sales force!

Naturally, you want to cut costs wherever possible. But trimming your sales force isn't a practical solution . . . nothing costs more than not doing business. Isn't it wiser to thoroughly investigate every other possible means of cutting costs?

How about fuel waste? Fuel consumption in relation to your business is intelligently discussed in the new booklet, "Savings in Fuel." This booklet may make it possible for you to continue to expand your sales promotion and advertising programs.

We will mail this booklet to you without obligation. It has been prepared by a group of leading manufacturers in the heating industry. Just fill in the coupon below. Mail it today.

THE HERMAN NELSON CORPORATION
MOLINE, ILLINOIS

THE HERMAN NELSON CORPORATION
Moline, Illinois

Gentlemen:
Please send me the booklet which will show me how to cut fuel waste to an absolute minimum.

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

fins machine-bonded to the tubes.

Dimensions range from 19¼x19½x 20 to 43 1/16x23½x21 inches. Both single and dual fan units are available.

Tenney Engineering, Inc., 26 Ave. B., Newark, N.J.

•

Spray Lubricator

Automatic force-feed spray lubricator intermittently sprays oil on punch and shear operations, or other work needing this type of lubrication. Synchronized directly with the machines, device forces automatically timed jets of oil mist directly on the parts. Compressed air and oil are fed simultaneously into a sprayer nozzle aimed at the critical area. It is claimed that the air stream has a cooling effect upon dies, shearing edges, other parts.

Manzel, Inc., 244 Babcock St., Buffalo 10, N.Y.

•

Line Marker

Controlled-flow paint striper features a brushless, gravity feed, sled-type paint spreader. It accommodates any striping or zone paint, and with the use of a special shoe, it may be used to apply reflective paint. Interchangeable spreaders are available in widths from two to eight inches. Offset in operation, it permits a clear view of the line. Two models are available, the standard model with a 9-gal. tank, the other with a 5-gal. tank.

Universal Marine & Mfg. Corp., 137 Alexander St., Yonkers, N.Y.

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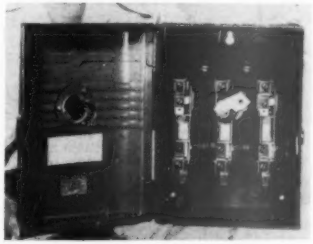


Safety Switch

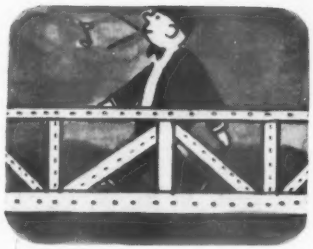
Designed for use in high capacity distribution systems, safety switch, HCI Type A, has an arc-quenching design and actuating mechanism. This is said to enable it to break

(Continued on page 303)

Safe . . . and versatile!

B S & B SAFWALK

can be used to build nearly any type of structure! *The grandstand illustrated above was built in Cody, Wyoming of standard SAFWALK parts. It is 250 feet long with twenty rows.*



SAFE! They're all steel. "Bridge type" bracing adds strength. Panels are non-skid. Joints protected. Completely fireproof.

VERSATILE! Salvage Value of SAFWALK is almost 100%! Structures can be taken down and re-erected in *any design* at new location.

EASY TO SHIP! Securely crated, SAFWALK is shipped "knocked down" so as to use a minimum amount of storage space and permit easy handling.

CLIP THIS COUPON

Get all the facts about BS&B's sturdy SAFWALK material NOW!

BLACK, SIVALLS & BRYSON, INC., 720 Delaware
Section WW-7, Kansas City 6, Missouri

I want full details concerning BS&B SAFWALK. ☐ Please forward complete data. ☐ Arrange to have Sales Engineer call on me.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

BS&B SAFWALKS

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Westinghouse

MAINTENANCE SERVICE

Your nearest Westinghouse Manufacturing and Repair Plant—one of a network of 36—is expertly manned and completely equipped for both regular and emergency repairs of all kinds of electrical apparatus.

FAST

Electrical Repairs

ALL OVER THE MAP—AROUND THE CLOCK

No matter where or when you may need fast repair service on your electrical equipment, you can get it from Westinghouse. Our newly-expanded organization makes this an accomplished fact.

Strategically placed at the hubs of all the important industrial areas, Westinghouse Repair and Maintenance facilities are co-ordinated to give you faster service than ever before.

Our Manufacturing and Repair Plant nearest you uses factory-trained personnel and factory methods to do the job the quickest possible way. For your major equipment, our Field Service Engineers diagnose trouble and make speedy repairs in your own plant. In addition, you get prompt shipment of genuine Westinghouse Parts from our local Renewal Parts Warehouse.

If a breakdown occurs, we can and will handle it. We work overtime whenever that is needed. For example, when lightning recently struck a 100-hp, 2,300-volt induction motor vital to the operation of the main water-pumping station in a Southern city, we completely rewound the motor in 2½ days.

Fast Westinghouse Service is available for all classes of customers—including Electric Utility, Transportation, Mining, Industrial, Marine and Aviation. Let us help you in solving your special maintenance problems. Contact your nearest Sales Office or M & R Plant. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-94821

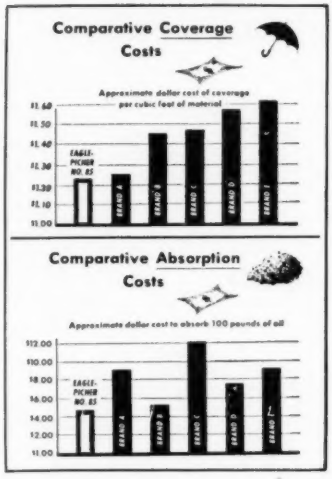
All Westinghouse Renewal Parts are manufactured to original specifications—using the latest materials produced by our research facilities—with the care taken in the manufacture of the original equipment.

To protect the operation of Westinghouse apparatus and insure fast service, genuine Westinghouse Renewal Parts are stocked in 33 Renewal Parts Warehouses conveniently located throughout the country.

Here's proof

Eagle-Picher Floor-Dry No. 85 gives you

More for your dollar!



Comparative scientific tests show that Eagle-Picher Industrial Floor-Dry #85 outperforms the five other leading brands of floor drying compounds.

Eagle-Picher Industrial Floor-Dry #85 is a granular mineral compound—chemically inert, non-combustible and insoluble in oil, grease, kerosene or water. It can give you positive reduction in operating costs plus greater safety. Write for complete information.

Packed in convenient 50-pound, multi-wall Kraft paper bags.

The Eagle-Picher Company

GENERAL OFFICES: CINCINNATI (1), OHIO

The Eagle-Picher Company
Department FM-109
Cincinnati (1), Ohio
Gentlemen: Please send me complete information about Eagle-Picher Industrial Floor-Dry No. 85.

EAGLE EP PICHER

Name _____

Address _____

City _____ *County* _____ *State* _____

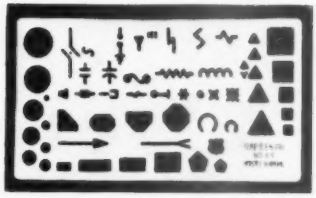
YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

DUAL-PURPOSE MICROFILMER AND READER. Makes, projects permanent film records of documents, periodicals, any printed or written matter. Can be projected on wall or screen, or in original size on base of instrument. Plugs in anywhere. Camera can be removed for candid black-and-white or color photographs, flash work. Uses 35-mm. film. Carrying case weighs 18 pounds, holds camera, lights, shutter release, copy stand, reader head. The Bolsey Corp. of America, 18 E. 25th St., New York.

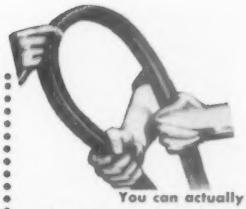
FOREMAN'S SELF-RATING CHART lists duties under general management, supervision, instruction. Called "Professional Foreman Functions Chart." May be used in training, as basis for improvement programs. Laurence G. Lyndahl, 155 Thistledown Dr., Rochester 12, N. Y.



TEMPLATE contains all transmission and distribution symbols for electrical drawing. Useful to distribution mapper, look-up man, draftsman. Size: 6x3¼ inches. Rapidesign, Inc., Box 592, Glendale, Calif.

SPRING DEVICE called Neg'ators. The more it is deformed, the less it resists. Wide range of expandibility, action. Acts around corners, through small openings. May be used as extension or compression spring, self-adjusting clamp, clip, precision force adjustment, transducer, automatic coiling device, friction element, telescopic tube form,

"SCREWSTICK" AND DRIVER. One-piece stick of identical small screws feeds into pneumatic rotary electric driver. Eliminates picking up, starting each screw by hand. Screws twist off automatically when predetermined torque is reached, next screw automatically advances into place. Sizes from No. 0 to No. 4. Tool has spindle offset of 9/16-inch, converts from one size to another. Screws may also be used with spiral or hand-ratchet drivers. Screwsticks by American Screw Co., 121 Stevens St., Providence 1, R.I.; tool by Independent Pneumatic Tool Co., 175 N. State St., Aurora, Ill.



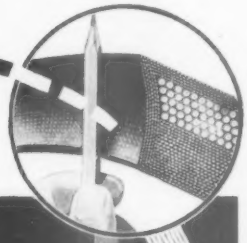
You can actually *feel* the sides of a belt *change shape* as the belt bends.

In Two Minutes You Can See Exactly How . . .

The Concave Side

(U.S. Patent No. 1813698)

SAVES Your Transmission DOLLARS



Take *any* V-belt in your hands and bend it as it bends in going around a pulley. You will see that the top of the belt, being under *tension*, grows *narrower*. The body, under compression, *widens*. The sides *bulge out*.

This shape change—in a *straight-sided* V-belt—is shown in Figures 1 and 1-A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Now look at Figures 2 and 2-A. There you see how the *same shape change* affects the V-belt built with the precisely engineered *Concave Side* (U.S. Patent No. 1813698).

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

The top of the belt narrows, the body widens. But the sides *merely straighten—and* the new shape *exactly fits* the sheave groove!

Two savings result. (1) Uniform side-wall wear *—longer life!* (2) Full side-wall grip on the pulley carries heavier loads and *sudden load increases* without slipping; saves belts, saves *power!*

The Mark of SPECIALIZED Research

The Concave Side is *MORE IMPORTANT NOW Than Ever Before*

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

4910

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

WET PICKUP—

a feature of this modern cleaner

Help! Help! A washbowl or a toilet is overflowing . . . the situation must be met immediately.

The wet-dry pickup feature of General Electric Heavy-duty Cleaning Equipment often saves its cost in just one such emergency as an overflow.

All over the building, these powerful vacuum cleaner units reduce cleaning costs and simplify the maintenance problem. An inexperienced man or woman soon becomes an expert with the special extension rods and brushes.

Even if you have a built-in vacuum system, you need this highly mobile equipment. Designed to General Electric's high standards, it's built to last.

SEND TODAY!

Write for specification data

Learn how General Electric Heavy-duty Cleaners clean the whole building with new speed and thoroughness. A careful survey of your building's requirements will be made without obligation.

Commercial Vacuum Cleaners

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, Dept. 22-1315
1285 Boston Ave., Bridgeport 2, Conn.

Our most serious cleaning problem is.....

Without obligation, please send specification data on your new equipment.

NAME.....

HOTEL.....

ADDRESS.....

CITY..... STATE.....

other applications. Hunter Spring Co., Lansdale, Pa.

INSULATION. Braided Fiberglas tubing and sleeving. BH-649. With stands knotting, twisting, direct flame, high temperatures. Cuts clean, no frayed ends. Superior dielectric properties. Bentley Harris Mfg. Co., Conshohocken, Pa.

LIQUID PLASTIC FOR CASTINGS. Called Glasy-Cast. Clear, water-white polyester resin. Intended for small jobs, or for performance testing of models before making permanent molds. Can be used with manufacturer's molding compound called Elasto-Mold, which makes quick, accurate molds for from one hundred to several thousand castings. Plastic Service, 294 Washington St., Boston 8.

MOBILE FIRST AID CABINET called Rolla Bench. Six "no-spill" sliding drawers, deep compartment at bottom. 29x34 inches, 17 inches deep. Rubber wheels; hidden roll-top lowers into position for locking. Dept. "O", Snap-on Tools Corp., Kenosha, Wis.

"MAGNETIC" ADHESIVE, H-511 Ubabond, for pre-cementing surfaces to be joined at later date. Dries to nontacky state in 15 to 30 minutes. Facilitates handling on assembly line, or shipping for later assembly. When pre-cemented surfaces are joined, bonding agent may be reactivated by heat or solvent. Union Bay State Chemical Co., 50 Harvard St., Cambridge, Mass.

ALLOY CAST STEEL FOR SUB-ZERO USE. Said to fulfill engineering requirements at temperatures as low as —423 degrees. F. in processing

OIC

SETS THE PACE IN VALVES

WITH A *LONG LINE* THAT FILLS YOUR NEEDS

OIC is one of the few producers of a complete line of bronze, iron, cast, forged and stainless steel valves to meet your varied requirements. And OIC Valves are made in one of the most modern valve plants in the country, with exclusive OIC-designed machines that build pace-setting features into every single valve.

Examples?

• Bronze Bonnets of union type construction assure a tight bonnet joint and permit quicker and easier inspection and servicing. • Stuffing Boxes are integral with the bonnet and provide ample packing space. • Large diameter stems are Manganese Bronze. Long sections of accurately cut Acme form threads insure easy operation and long life. • Bronze Swivel Nuts permit the disc to rotate freely on the stem, yet join the two parts securely. • Discs are made of Nickel-Copper alloy, heat treated to a minimum hardness of 300 Brinell.

All these features mean more valve for your money — better service at lower costs!

NO. 552

OIC VALVES

FORGED STEEL • CAST STEEL • IRON • BRONZE

0-749-90

ELIMINATE REPLACEMENT PROBLEMS!

The OIC Cross Reference Chart makes changing over easy. Simply look at the figure number of the valve on the line, check your Chart, and you'll find the correct OIC Valve to replace it. Write for your free copy today!

THE OHIO INJECTOR CO.
Wadsworth, Ohio

WOLMANIZED PRESSURE TREATED LUMBER

Means Absolute Protection to Wood Endangered by ROT and TERMITES

Water Tanks

Sills and Joists

Cooling Towers

Roof Decks

Humidified Buildings

Foundations

Floors

Other Moisture "Traps"

Here are six common conditions where WOLMANIZED Pressure-Treated Lumber provides protection from decay and termites:

1. Where excessive ground moisture, rain or thaws cause early decay failures.
2. Where wood near the ground is open to termite attacks.
3. Where wood is in contact with damp concrete or masonry.
4. Where steam and vapor from industrial processes promote wood decay.
5. Where walls, floors, ceilings are subject to condensation from refrigeration.
6. Where wood is exposed to moisture in artificially humidified buildings.

Investigations by qualified technologists prove that on installations where decay and termites ordinarily shorten lumber life, WOLMANIZED Pressure-Treated Lumber lasts *Three to Five Times Longer* than untreated wood.

Such lasting protection is assured because penetrating, preservative solutions are forced, by vacuum-pressure treatment, deeply into the wood fibers of WOLMANIZED Lumber. And, WOLMANIZED Lumber is clean, odorless, paintable, non-corrosive, non-leaching and glueable. Only WOLMANIZED Lumber offers *all* these extra advantages.

YOU'LL PROFIT BY GETTING THIS INFORMATIVE BOOKLET

Get all the facts and cost-saving figures on WOLMANIZED Lumber. See why it offers you the best protection available against wood decay and termites. Write for this valuable booklet today.

AMERICAN LUMBER & TREATING COMPANY

General Offices: 332 South Michigan Avenue, Chicago 4, Illinois

Branch Offices: Baltimore, Boston, Jacksonville, Fla., Los Angeles, New York, Philadelphia Portland, Ore., San Francisco, Washington, D. C.

industries, other applications. May be welded by gas or electric processes, without need for subsequent heat treatment, without embrittlement. Lebanon Steel Foundry, Lebanon Pa.

COUNTERFEIT MONEY SPOTTER. Dial-type device, called Spuriscope. When serial number of any bill is dialed, correct alphabetical series appears. If bill in question has other letters, it's not genuine. Ruth Devices Corp., 11 Broadway, New York 4.

CAPACITOR COMPUTING CARD. Tells how many kilovars, what power factor, how much voltage rise. Diagrams illustrate each formula. $3\frac{3}{4}$x$2\frac{1}{4}$-in. double card GEN 22. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

MOTOR EXCHANGE PLAN for single- and three-phase, 1- to 20-hp., frame 203 to 326, a.c. motors. Three plans outlined in Booklet SM/5243. Westinghouse Electric Corp., Box 868, Pittsburgh.

FILMS

"The Training Film Annual." Soundslide film catalog. Describes, illustrates 327 "ready-to-use" programs for instruction, training. Also projection equipment, accessories. Commercial Films, Inc., Box 7, Cleveland 21.

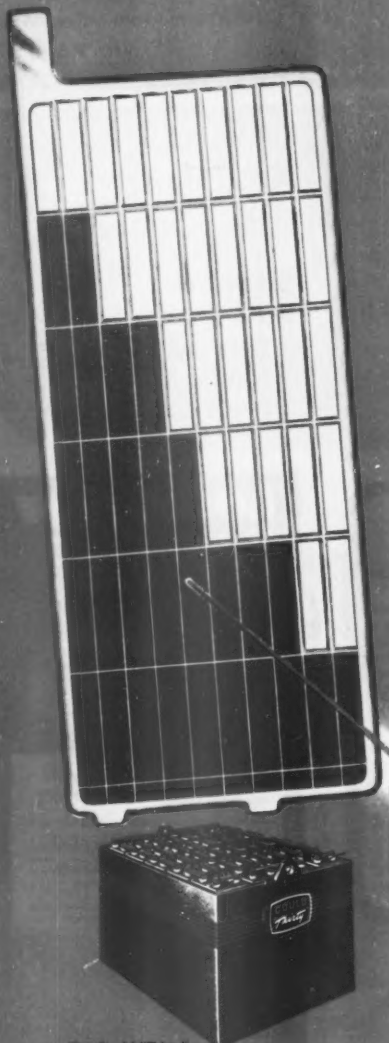
Textiles Unlimited is a 16-mm. sound color motion picture, running about 26 minutes. Shows new equipment and processes under development in laboratories, pilot plants, mills. Stresses role of electrical equipment. Part of "More Power to America" series. General Electric Co., Schenectady, N. Y.

Production Miracles Through "Controlled-Air-Power" is a case history film illustrating cost reductions made possible by use of pneumatic devices. 16-mm. sound motion picture; runs 28 minutes. The Bellows Co., 222 W. Market St., Akron, O.

Uses Unlimited shows development, manufacture, use of precision switches. 16-mm. color and sound motion picture; runs 35 minutes. Micro Switch, Div. of First Industrial Corp., Freeport, Ill.

NEW GOULD "Z" Plate

THE ONLY PLATE WITH OXIDE THAT RENEWS ITSELF!



The Gould "Thirty" . . . More Than Ever, America's Finest Industrial Truck Battery

Only Gould gives you a power-producing regenerative oxide that renews its energy every day the battery is in use.

And—Only Gould's revolutionary, new "Z" grids are non-porous and solid all the way through.

The "Z" plate is the result of new techniques developed and perfected in the Gould Research Laboratory and proved in Gould's own pilot plant.

These exclusive Gould developments are why Gould batteries move more tons more miles . . . operate at full capacity more months . . . give more for your battery dollar than ever before.

Ask for literature on how Gould's new research developments make Gould Batteries Stay New, Longer.

GOULD

STORAGE BATTERY CORPORATION

TRENTON 7, NEW JERSEY

Always Use Gould Automobile and Truck Batteries

CLEANS ANY FACTORY FLOOR IN 1 FAST, EASY OPERATION!

It's a fact! *Traffic-packed grime . . . incrusted grease, dirt and metal cuttings . . . rubbery layers of dried paint . . . granite-hard blobs of spilled concrete*—in fact *any* kind of soilage on floors can be whisked off in minutes with a Tennant Floor Machine.

Expressly designed for tough jobs that usually take hours or days of tedious hand scraping, the self-propelled Tennant Machine cleans any floor in one operation. And it's an easy one-man job. There's no scraping, no messing with water or chemicals, no "sweeping up" to do.

Dirt is cut loose with fast-cutting drum type steel wire brush or Revo-tool, then hurled into built-in soilage hopper; lighter dust is sucked into vacuum bag. Action of high speed 12" or 16" brush smooths and levels floor surface.

Result: a smooth, clean, *dry* floor—ready for immediate traffic.

6 TYPICAL ADVANTAGES

1. REQUIRES ONLY 1 MAN.
2. CUTS CLEANING COSTS as much as 50%.
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4. REDUCES HAZARDS; keeps floor dry, smooth.
5. CLEANS ANYWHERE; doesn't halt plant operation.
6. IDEAL FOR ANY TYPE of shop floor.

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Has hundreds of drum-mounted alloy-steel cutters to provide a scarifying and pulverizing action for cleaning and leveling floors. High speed hammer-mill action removes grease, tar, chips, paint, cement.

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Model "B"

All-purpose work clamps NOW in two sizes

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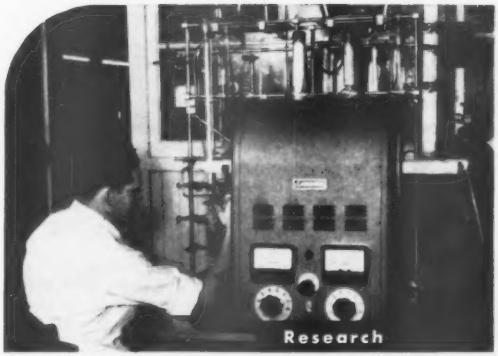

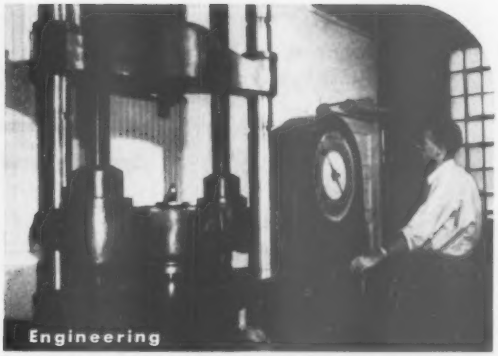

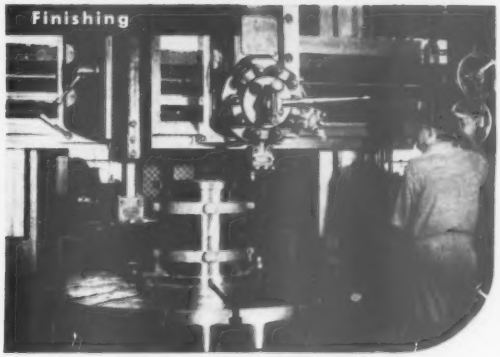

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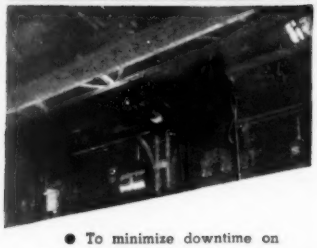
Reduces
MACHINE DOWNTIME



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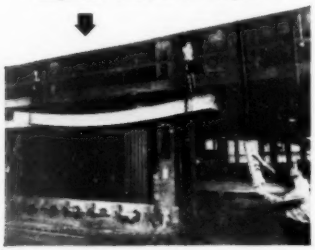

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Chain Hoists • Electric Hoists
Overhead Traveling Cranes

READING HOISTS

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Adjunct Professor of Industrial Relations, New York University and a Member of the New York Bar

Period Surveyed: August 1 to September 1

Labor Management Relations

HELD REFUSAL TO BARGAIN:
Challenging the union's majority status within a year following its certification as bargaining agent, ignoring union requests to fix a date for negotiations, and refusing to continue negotiations until withdrawal by the union of its previously filed unfair labor practices. (Sussex Hats Inc., NLRB)

Challenging union's majority within a certification year, since the duty to bargain is not removed by loss of alleged or real union majority except in unusual circumstances. (Vulcan Forging Co, NLRB)

HELD INTERFERENCE:
Statement to employees that if they joined the union the employer it would discontinue efforts to replenish supplies by securing additional yarn and would stop Christmas and Easter bonuses. (B & Z Hosiery Products Co., NLRB)

HELD NOT INTERFERENCE:
Pre-election employer statements. Letter by employer four days before election urging employees to ask themselves if they wished to continue working steadily, at good rates and with substantial overtime, or preferred to risk strikes, lost wages and a contract which might result in loss of overtime work; also describing his efforts to improve conditions of employment and contrasting the disruptive conduct of unions with efforts to "find work" for the employees under conditions which in an organized plant would lead to unemployment. (Cleveland Plastics, Inc., NLRB)

OFFER OF REINSTATEMENT
Offer of reinstatement communicated by employer through a fellow employee does not satisfy the statutory requirement which calls for management's offer to reinstate. (B & Z Hosiery Products Co., NLRB)

PROTECTION OF BOARD CERTIFICATION
A preliminary injunction was granted regional director to enjoin defendant union from maintaining a strike at an employer's plant where employees were already represented by another union which was certified by the Board. If defendant union's claim that it represents certain employees, who spend only part of their time performing shipping and maintenance services, has any merit, the union should proceed in orderly fashion to apply to the Board instead of resorting to self-help. (Humphrey *v.* Teamsters Union, US DC, SD, N.Y.)

INJUNCTION NOT STAYED PENDING APPEAL
Interlocutory injunction granted to a regional director to restrain a union for a period of three months from engaging in certain activities violative of the secondary boycott provisions of the Act may not be suspended pending appeals, despite the union's claim that the injunction was so broad as to work a hardship on it. Were the injunction to be suspended pending appeal, one of the parties might be placed in a position to destroy the utility of any final decision of the Board. (Building Trades Council *v.* LeBaron, CCA 9)

SECONDARY BOYCOTT—INJUNCTION GRANTED
U. S. District Court granted a regional director a preliminary injunction restraining teamsters from peacefully picketing entrances to brewery's driveway. While the primary purpose of the picketing was doubtless to induce the employee of Sterling Beverages not to move their trucks about on Ruppert's property, thus forcing Sterling Beverages to employ members of the respondent union to do this work, the inescapable result was to induce employees of Ruppert to engage in a concerted refusal to perform their services in connection with the unloading and loading of the Sterling trucks and thereby to cause Ruppert to cease doing business with Sterling. (Douds *v.* Teamsters Union, USDC, SD N.Y.)

U. S. District Court granted temporary injunction restraining union from inducing or encouraging employees of a machinery company to refuse to perform certain work sent to the machinery company by a plating company whose employees were on strike in an effort by the union to force machinery company to cease doing business with the plating company. (Evans *v.* Metal Platers Union, USDC, SD, Ind.)

SECONDARY BOYCOTT—EFFECT OF PLACE OF PICKETING
No secondary boycott was held to have been effected where the picketing was wholly at the premises of the primary employer with whom the

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"Cleans floor area size of city block in 6½ hours"

"Does 4-hour cleaning job in 30 minutes"

"Cleans 55,000 sq. ft. of floor in single day"

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Now especially, with the need for cutting costs, savings such as are possible with a *Finnell Scrubber-Vac* are well worth investigating.

With a *Finnell Scrubber-Vac*, all four of the floor-cleaning operations can be done mechanically! This combination machine applies the cleanser, scrubs, rinses if required, and picks up. With one or two operators, a *Finnell Scrubber-Vac* can do a cleaning job better in half the time it takes a crew of six to eight using separate equipment for the several operations.

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Have a talk with *the nearby Finnell man*. See what *you* would save with a *Finnell Scrubber-Vac*. Incidentally, it's good to know that when you choose *Finnell Equipment*, a *Finnell* man is readily available to help train your maintenance operators in its proper use. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2510 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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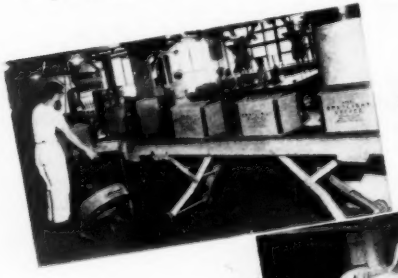
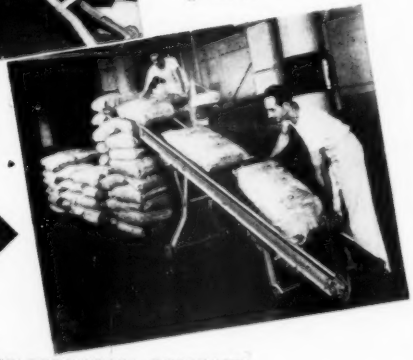
Move the A-F BoostA-Flow anywhere—plug it inot any electrical outlet and it's ready to go to work. The special "grip top" belt provides sure flow for cartons, cases, bags, light tote boxes and luggage. Many other unique features.

The A-F BoostA-Flow, like all A-F Conveyors and A-F *Engineered* Completely Co-ordinated Conveying Systems, represents 18 years of know-how. Why be satisfied with less? Discuss *your* materials-handling and products-handling with A-F Engineers. ***Write for a new, illustrated A-F BoostA-Flow folder, or a frank discussion of the most modern handling systems—today!***



This food processing plant uses an A-F BoostA-Flow adjusted to the height of the carton-closing machine to convey cartons from the filling line to various storage areas.



Even bags and other containers wider than the conveyor belt are quickly and efficiently handled, as the belt is higher than the frame.

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CONVEYING EQUIPMENT

A-F CONVEYING MACHINERY

Alvey-Ferguson

LABOR DEVELOPMENTS *(continued)*

union is engaged in a labor dispute, where the incidental effect of such picketing was to seek the aid of employees of customers and suppliers of the principal employer. (Electrical Workers, NLRB)

PICKETING WITH FALSE SIGNS

N. Y. Supreme Court held that a union does not have the right to picket an employer whose employees are not on strike by falsifying the facts through misleading placards. (Hardy's Hillside Inn *v.* Clement)

UNION UNFAIR LABOR PRACTICES—RESTRAINT AND COERCION

Crowd picketing in front of a plant's entrance was not coercive where employees were free to pass through the gate if they desired and none of the pickets engaged in violence or threats. (Electrical Workers, NLRB)

BACK PAY

Employer and union were both held liable for the back pay due wrongfully discharged employees. The NLRB will not attempt to adjust between them the amount of back pay for which each is liable, but will merely order them jointly and severally to make whole the discharged employee for the losses suffered, for the "Act makes no distinction between primary and secondary responsibility for discriminatory treatment of an employee." (H. M. Newman, NLRB)

ENFORCEMENT—PROTECTION OF BACK PAY AWARD

The 6th Circuit Court of Appeals held that the NLRB is entitled to an *ex parte* temporary restraining order enjoining an employer from disposing of proceeds realized on liquidation of its assets, unless it deposits with the court a bond to insure compliance with the court's decree should enforcement of the Board's back-pay order be granted by the court. (NLRB *v.* Burnette, CCA 6)

UNION SECURITY—INVALIDITY

The presence of a severability clause in a contract which contains an unauthorized union security provision will not prevent an election to determine the bargaining agent. The fact that the parties had taken no action with respect to the illegal union security clause is immaterial. The mere existence of the provision has the effect of restraining those who desire to refrain from union activities within the meaning of the statute. (A & M Woodcraft, Inc., NLRB)

UNION SECURITY—ILLEGAL CLAUSE—EFFECT OF SEVERABILITY CLAUSE

A severability clause in a supplemental agreement which nullifies any provision in the original contract which is contrary to federal or state law does not nullify an illegal union security clause. It merely means that the union security clause remains effective unless and until the proper tribunal determines that it is

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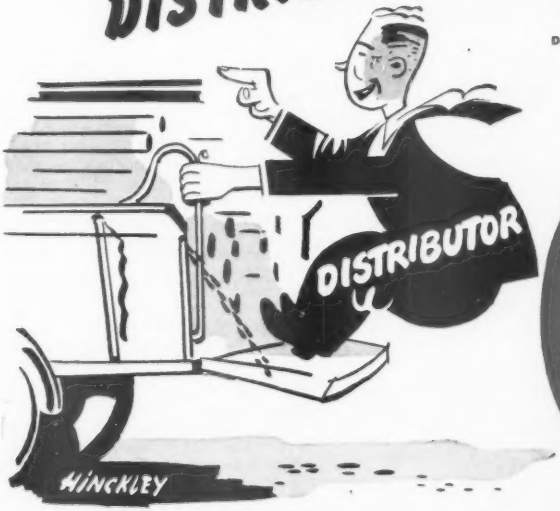

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LABOR DEVELOPMENTS *(continued)*

invalid. (Matter of Lykens Hosiery Mills, Inc., 82 NLRB No. 125, 23 LRRM 1653.) Therefore, the original contract as amended does not bar a representation proceeding. (Matter of Unique Art Mfg. Co., 83 NLRB No. 173, 24 LRRM 1189; Matter of C. Hager & Sons Hinge Mfg. Co., 80 NLRB No. 163, 23 LRRM 1044.) (Evans Milling Co., NLRB)

SENIORITY—EFFECT OF LABOR CONTRACT

Seniority rights established by a collective bargaining agreement may be altered by a subsequent contract entered into by the bargaining agent, and employees whose seniority rights are adversely affected by the second contract are not entitled to injunctive relief against the union and employer to prevent them from making the contract effective. (Langhurst *v.* Pittsburgh & Lake Erie R.R., Pa. Ct. of Common Pleas)

UNION INTERVENTION IN EMPLOYEE'S ACTION

A union has the right to intervene in an action by an employee for restoration of his seniority rights, since the outcome may adversely affect the seniority of other union members or disturb the rights of other employees, members of the petitioning union. (St. Clair *v.* Baltimore & Ohio R. R. USDC ND, Ohio)

AGENT OF EMPLOYER

An employee who is owner of one third of the corporate stock, whether a supervisor or not, is identified as management and therefore may be management's agent. (Anchor Rug Mill, NLRB)

ELECTIONS

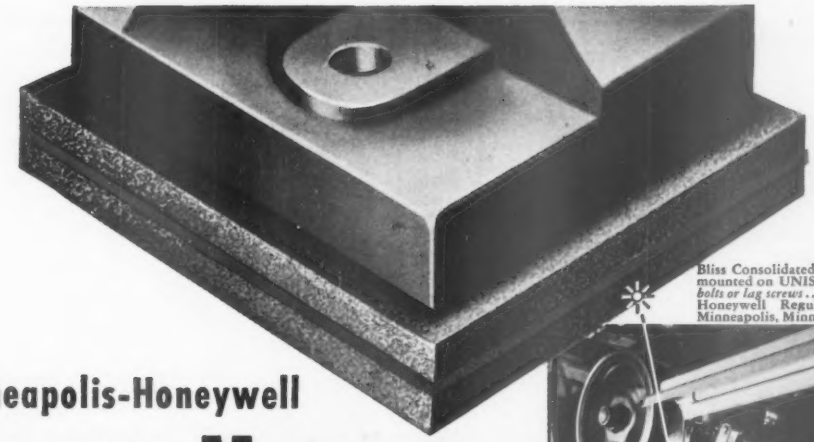
Under the Labor Board's form of consent election, providing that the determination of the Regional Director on objections to the election shall be final and binding, an employer cannot refuse to bargain on the ground that he has been denied a hearing on objections where the record shows employer was afforded an opportunity to submit evidence and conducted an investigation. If there is evidence to support the Regional Director's determination, he cannot be said to have acted arbitrarily or capriciously. (Merrimac Hat Corp., NLRB)

DECERTIFICATION

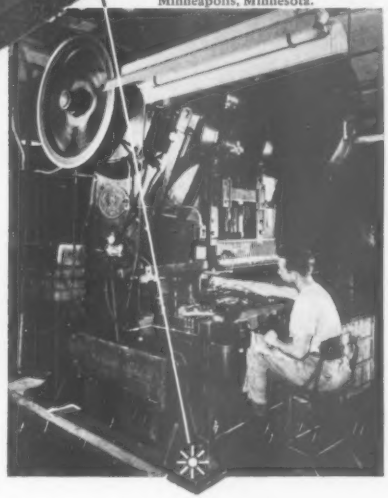
Decertification proceeding initiated by a "supervisor" who does not exercise supervisory authority within the meaning of the labor law (does not effectively direct other employees, nor does he effectively hire, discharge, or effectively recommend any change in employee's status) cannot be dismissed, since such a petitioner is an employee within the meaning of the Act. (Kelsey Hayes Wheel Co., NLRB)

COURT OVERRULES BOARD TEST OF SUPERVISORY STATUS

The Circuit Court of Appeals has ruled that whether an employee is



Bliss Consolidated #8 Punch Press mounted on UNISORB . . . *without bolts or lag screws* . . . at Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota.



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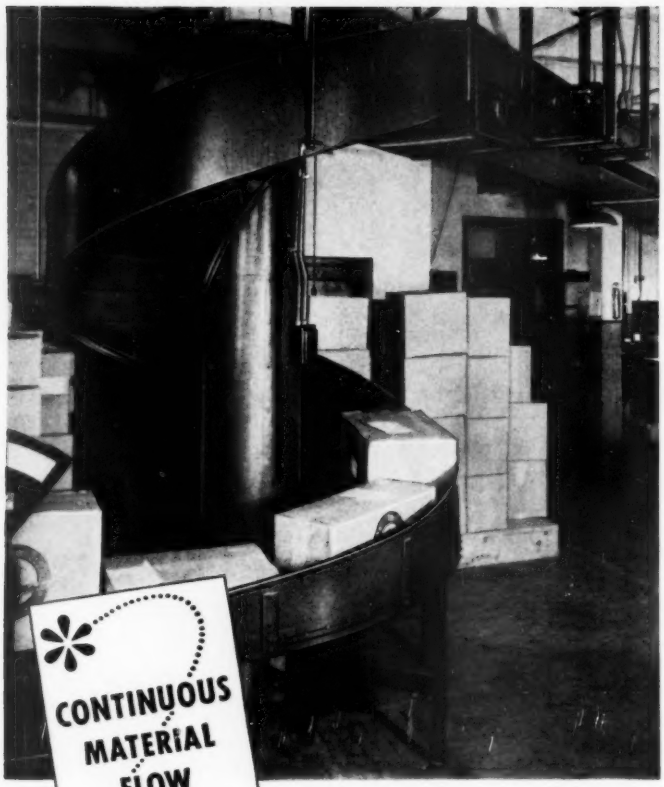

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a supervisor under the Labor Act depends on what authority he has and not on how often he exercises his authority. The broad definition of a supervisory employee in the Act includes one with "responsibility to direct" others. The Board had ruled that an employee having such authority is not a supervisor if he exercises it "sporadically and infrequently." (Ohio Power Co. *v.* NLRB, CCA)

CONTRACT INTERPRETATION AND ADMINISTRATION

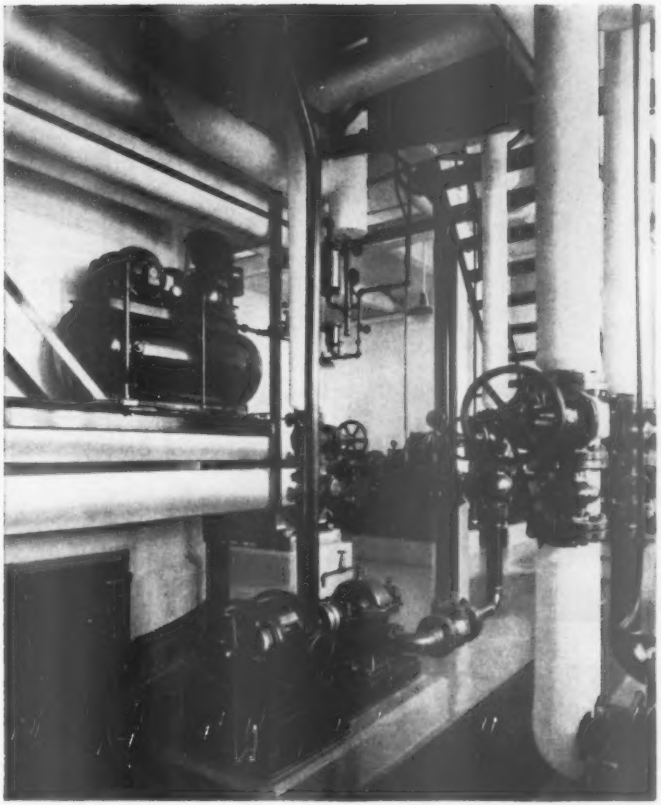
Management Rights. Under a contract which provides that the normal work week shall be eight hours per day, forty hours per week, beginning at 7 a.m. Monday and ending at 7 a.m. Saturday, management has the right to reduce the number of hours. There was nothing in the history of the negotiations to indicate that a reduction of work had to be made by lay off rather than lessening the hours of work. (Geuder, Paeschke & Frey Co., NLRB)

Work restrictions. Management may not ostensibly abolish a job and assign the duties of that job to supervisory employees who are not members of the bargaining unit. In effect the action amounts to a transfer of work from bargaining unit members to nonbargaining unit members—a right which does not belong to management under a clause reserving to it all rights customarily exercised by it. To concede such a right on the part of management would in effect vitiate the seniority provisions pertaining to job sequence for promotion and demotion. (W. V. Pulp & Paper Co., NLRB)

Union security. Where the contract excepts from the obligation to join the union employees hired prior to the execution of the contract, such employees were not required to join the union to retain their jobs. (Hallbach Restaurant, NLRB)

Departmental seniority. A contract which provides that transferred employees who wish to return to their former department lose their seniority, and must begin at the bottom of the promotional ladder, deprives a foreman of his seniority on his transfer back to the unit. In the absence of express contractual provision such as one that entitles union officers to retain their seniority, employees outside the bargaining unit (such as a foreman) cannot accumulate seniority. (Corning Glass Co., NLRB)

What constitutes discharge. An employee who walked off his job after a dispute with the employer's specialist concerning the use of materials was held to have quit rather than to have been discharged. Although the employee was told by the specialist that he was not the man for the job, the foreman, who was



Pratt & Whitney's 14-mile K&M insulation starts here. It's fit for the job and looks fit!

Where K&M "*Featherweight*"® 85% Magnesia

Keeps up steam...keeps down cost...for 14 miles

Pratt & Whitney Division of Niles-Bement-Pond Company, West Hartford, Conn., has long been noted for fine machine tool, cutting tool and precision gauge manufacture. The scientific attitude is a Pratt & Whitney habit. They applied it to saving b. t. u.'s along 14 miles of steam lines throughout their large power plant and shops. That led them to use K&M "Featherweight" 85% Magnesia pipe insulation for maximum efficiency and permanence.

The inherent insulation effectiveness of K&M "Featherweight" 85% Magnesia comes from basic Carbonate of Magnesia. This is combined with clean Asbestos Fibre in correct proportion for needed weight-saving strength. Therefore it is easy to do a fast, shipshape insulation job whose continued efficiency does not depend on costly maintenance.

Designed for temperatures to 600° F., K&M "Featherweight" 85% Magnesia comes in all standard sizes. Like the other K&M insulation materials, it can save you waste—difficulty—money. Get help on any points by consulting your nearest K&M Distributor—an insulation expert.

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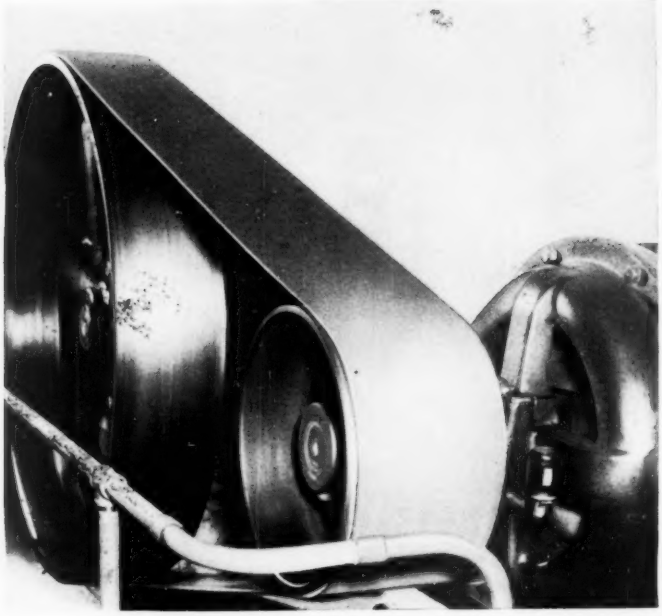

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LABOR DEVELOPMENTS *(continued)*

the employee's superior, rather than specialist, urged him to return to the job. (St. Regis Paper Co., NLRB)

Discharge arbitrable. A company is obligated to arbitrate the discharge of an employee who struck in violation of a contract (even though the contract barred the issue from arbitration, except the claim of nonparticipation in the strike) where management waived its right by specifically agreeing to process the grievances. (National Lock Co., NLRB)

Discipline justified. An employee who refused to perform additional work was properly laid off for the rest of the day, despite management's failure to comply with the contract's requirement that employees be given seven-day notice of change in work load. (Dwight Mfg. Co., NLRB)

Automatic wage increases. Interruption of employee service because of a strike did not prevent the operation of a contract provision based on specified periods of employment rather than the period of actual work or service. The strike settlement agreement expressly provided for the reinstatement of "striking" employees without any penalty for strike activity. (Burndy Engineering Co., Inc., NLRB)

Attendance bonus. A bonus of a day off for four months' perfect attendance was payable in a day's pay where the employees were laid off with little likelihood of reemployment during the period when such day off was to be taken by them. (American Dye Wood Co., NLRB)

Overtime-on-overtime. A contract provision for one-and-one-half times the straight time rate for work in excess of eight hours in any one day is not applicable to hours worked beyond eight on the sixth day of the work week where the contract provided that such sixth day was to be paid for at the rate of one-and-one-half times the regular rate. (Phelps Dodge Refining Corp., NLRB)

Vacations. Time spent in grievance work by member of grievance committee cannot be treated as an absence from work in computing vacation credits since the grievance work is of equal if not of greater importance than ordinary production work. (W. H. Fisher Co., NLRB)

Where a layoff occurred approximately six weeks prior to the vacation period and the employees had completed the vacation requirements of the contract, they were held entitled to vacation pay. (Evangeline Shoe Corp., NLRB)

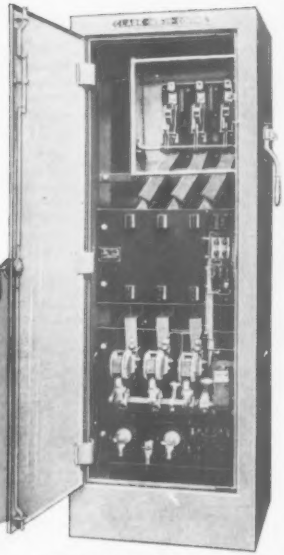
On the other hand, where eligibility for vacation pay is conditioned upon continuous service and proviso is made for loss of seniority after a one-year lay off, employees laid off for two months as of the vacation

NEW! CLARK Bulletin 6018 Size 5 COMBINATION STARTER with THERMAL OVERLOAD RELAY

Starter and Safety Switch in one Cabinet!

Interchangeable Heaters for On-the-Job Adaptation to Motor Characteristics!

Clark Bulletin 7322 Overload Relays for positive thermal Overload protection!



Bulletin 6018 Size 5 AC Combination Starter. Non-Reversing Magnetic Starter with Disconnect Switch—Fusible. (Fuses not shown)

Closed view of Bulletin 6018 Size 5 Cabinet, with dimensions.

● In this new design, the formerly-used magnetic overload relay, which required factory pre-setting to specific motor characteristics, has been replaced with the sturdy CLARK Bulletin 7322 Thermal Overload Relay. This permits adaptation of the starter to various HP ratings in the field —by simply changing standard heaters. To accomplish this, current is reduced in the relay circuit by "Do-Nut" type transformers mounted on load terminals.

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LABOR DEVELOPMENTS *(continued)*

eligibility date were held not entitled to vacation pay. (Jenkins Bros., NLRB)

Authority of arbitrator. Under a contract which strictly limits the powers of arbitrators to the application and interpretation of the agreement, as written, an arbitrator has no authority to arbitrate the general issue of job classifications.

The arbitrator agreed that although a general over-all approach to the problem of writing job descriptions may be more desirable from the point of view of costs, time, and effort, this is a matter for the parties to resolve through negotiations, present or future, and not for the arbitrator to determine, since he is prohibited by the contract from so doing. (Pacific Maritime Assn. of Calif., NLRB)

Wage-Hour Interpretations

EFFECT OF ADMINISTRATOR'S RULING

In an action by an employee for overtime pay, the mere fact that the employee was declared by the Wage-Hour administrator to be a bona fide executive and therefore exempt is no defense to an employer in a wage earner's suit, since the employer has the burden of proving that the employee is actually within the exempt classification.

In reversing the lower court's dismissal of the action the N.J. Superior Court observed that "the record contained nothing as to whether the plaintiff customarily directed the work of others or had discretionary power or had the right to hire or fire or recommend hiring or firing, or did work of the same nature as that performed by nonexempt employees, and contained little, if anything, as to the other factors." (Sherman *v.* Coastal Cities Coach Co., 9 WH 51. N.J. Sup. Ct., App. Div.)

UNPAID OVERTIME RECOVERABLE BY ADMINISTRATOR

The Wage-Hour administrator can obtain not only injunctive relief, but also an order to compel a defaulting employer to pay unpaid overtime wages to employees entitled thereto under the Wage-Hour Act. The right to bring an action to recover unpaid overtime does not belong exclusively to the employees.

Quoting from the Supreme Court's opinion, the Circuit Judge said that: "If the court is powerless to require the prescribed payments to be made, it has lost the most effective sanction for its decree and a premium has been placed on violations. The fact that another suit (by employees under 16b) might be brought to collect the payments is, of course, immaterial. For the court need not sit supinely by waiting for some litigant to take the initiative." (McComb *v.* Frank Scerbo & Sons, Inc., CCA 2)

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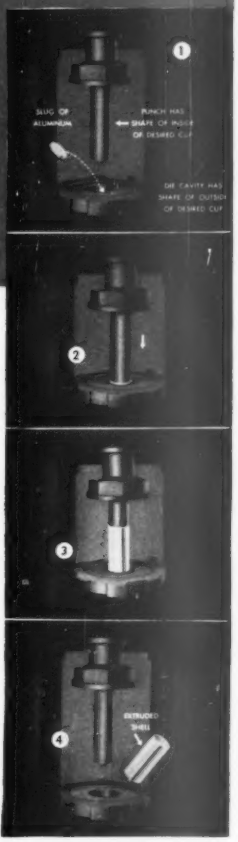

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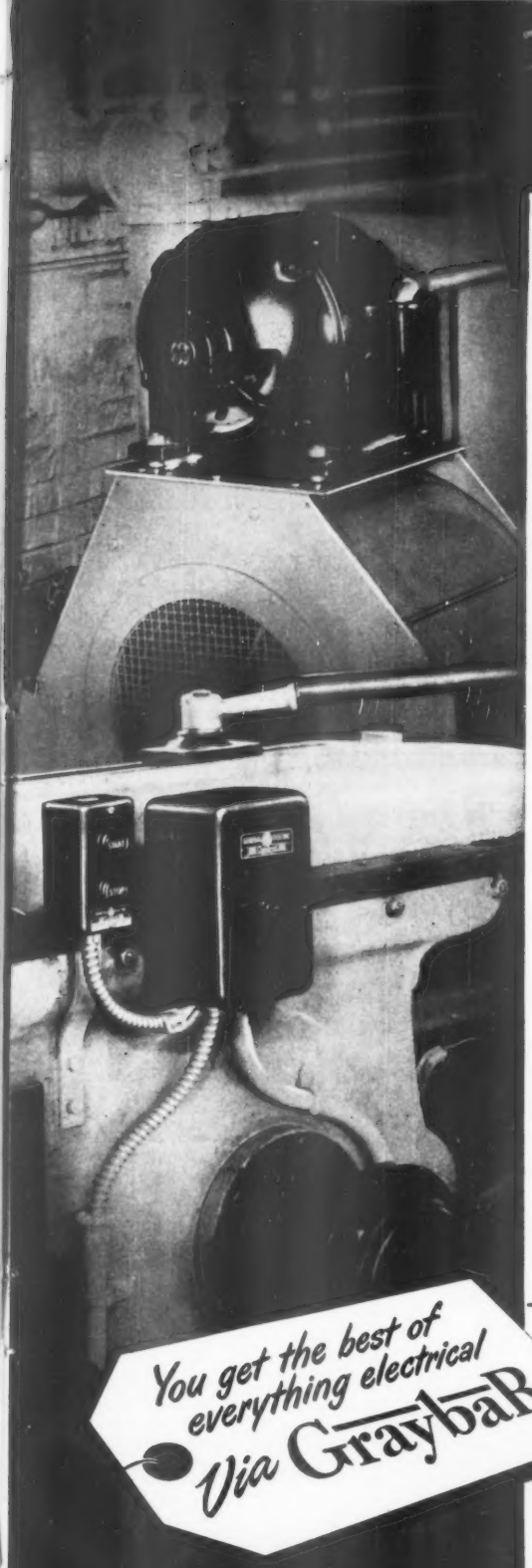

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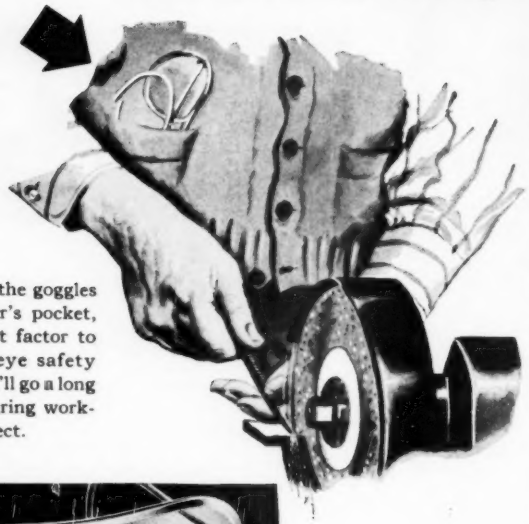
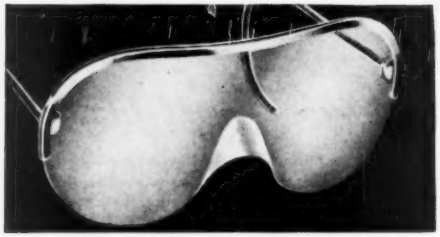


In order to get the goggles out of a worker's pocket, add the comfort factor to protection in eye safety equipment. You'll go a long way towards curing workers of such neglect.



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BEHIND THE BYLINE

Facts About *Factory's* Authors

Alonzo Flack (page 66) is chairman and treasurer of The Emerson Engineers. He is a native of New York State, and graduated from Syracuse University with a degree of M.E. Among his many clubs he lists membership in A.S.M.E., S.A.M., National Management Council, Engineers Club of New York, Industrial Management Society of Chicago, and Army Ordnance Association. His hobby is boating.

•

K. A. Vaughan (page 122) is a 20-year man at Gould Storage Battery. He started on the bottom rung of the ladder in 1928, and worked his way through every department in the Gould plant in Depew, N. Y. In 1934 he went on the road as a service manager. After nine years of trouble shooting, he spent two years as salesman in New York State. In 1945 he was appointed service manager and while in this position he established the field engineering system. Shortly after the merger of Gould with the Storage Battery Division of the Philco Corporation he was appointed field engineering manager, the position he now holds.

•

E. G. Ahlman (page 136) was born in Sweden, came to this country in 1912. A year later he went to work as a carpenter for the Willard Storage Battery Company, where he was later made foreman of the millwright division. He was appointed to his present position of maintenance manager in 1944. He owns a small poultry farm, and spends all his spare time there remodeling the house, and hunting and fishing.

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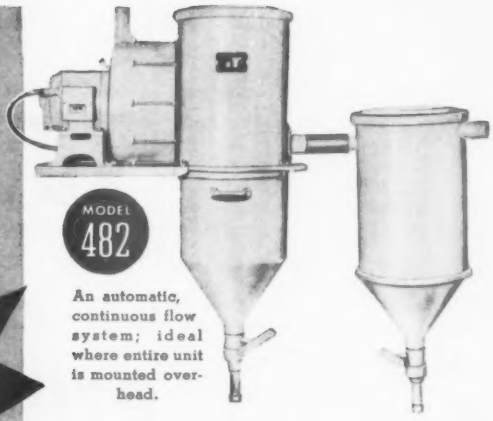

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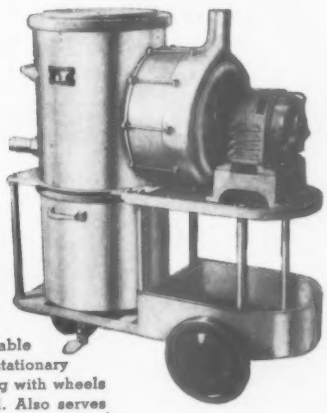

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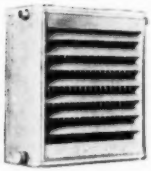
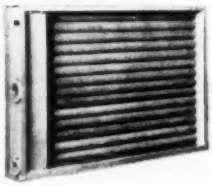


Unit Heater



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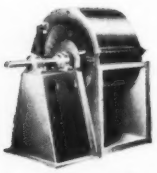

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Centrifugal Compressor

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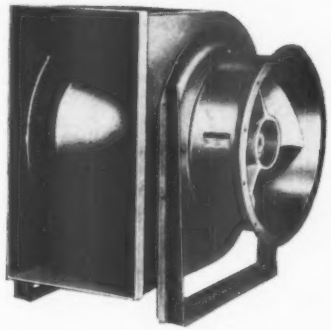

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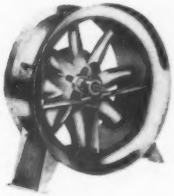

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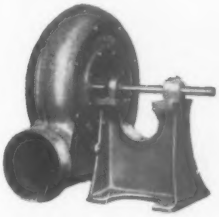

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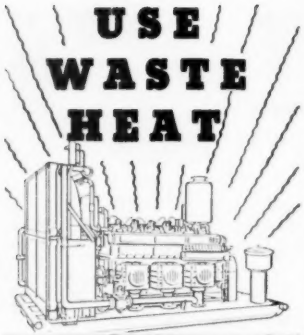

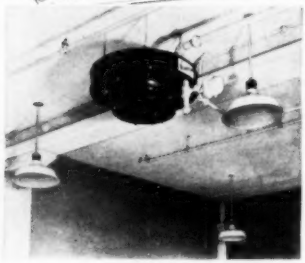

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One of the Industrial Organization and Management Series. Reports what progressive companies are doing to bring foremen into more active management participation.

The UAW and Walter Reuther

IRVING HOWE and **B. J. WIDICK**, Random House, 457 Madison Ave., New York 22. 309 pp. Notes, index. $3.

The story of the rise of industrial unionism as exemplified by the UAW, CIO, is told here. This is not a chronological history, but an account of the internal and external struggles of the union, its problems, and its relation to postwar trends.

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American Society of Tool Engineers. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 2070 pp. Tables, formulas, diagrams, drawings. $15.

Subtitled "A reference book on all phases of planning, control, design, tooling, and operations in the mechanical manufacturing industries." The material is based on up-to-date standards, and new techniques and processes are reported.

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Discussion of problems involving management decisions in industry, with questions and answers, case histories. Planning, organization and control, plant location, and physical facilities are some of the topics covered.

Introduction to Industrial Management

FRANKLIN E. FOLTS, M.B.A., Prof. of Industrial Management, Grad. Sch. of Bus. Adm., Harvard Univ. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 3rd ed. 648 pp. Specimen forms, layouts, tables, graphs, charts, sketches, diagrams, index. $5.

Twenty-three aspects of industrial management are analyzed, each illustrated by actual problems, and various solutions reported.

Bottom-Up Management

WILLIAM B. GIVEN, Jr., Pres., American Brake Shoe Co. Harper & Bros., 49 E. 33rd St., New York 16. 171 pp. Appendixes A, B, C. $2.50.

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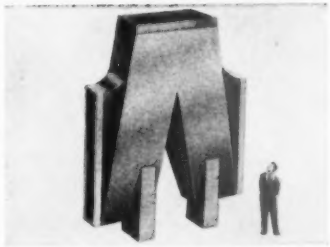

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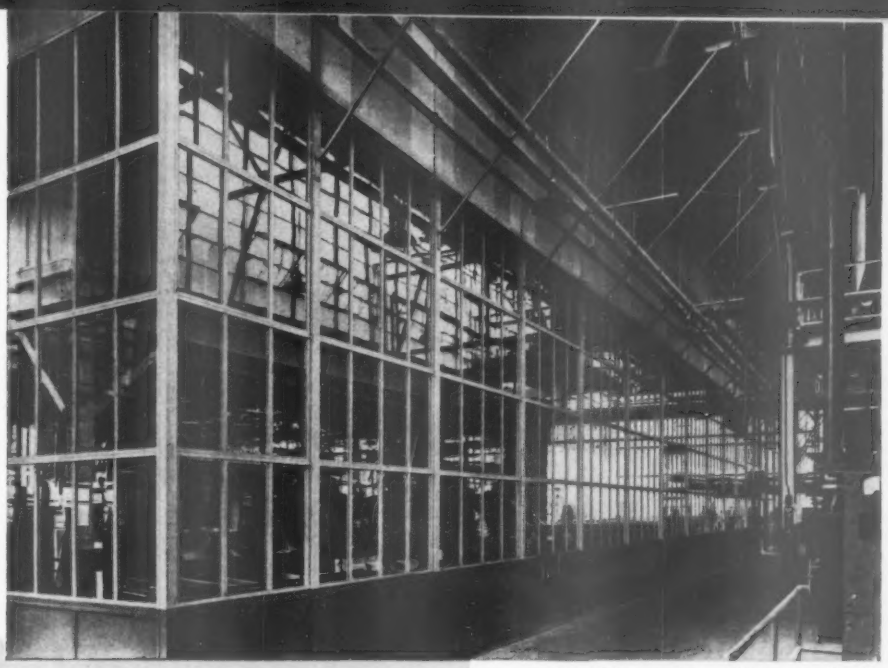

One of the several types of Hauserman *Movable* Steel Walls used by Inland Manufacturing Co., Division of General Motors Corporation.

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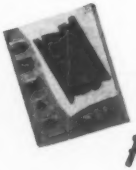
Want all the facts? Just write or call the Hauserman office or representative nearby or contact *The E. F. Hauserman Company, 6754 Grant Avenue, Cleveland 5, Ohio.*



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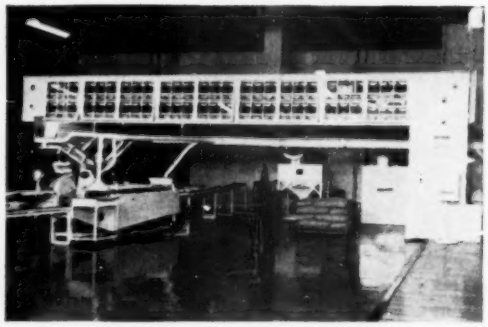

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DUST CONTROL EQUIPMENT

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

butions from both supervisory and rank-and-file employees.

Robert Johnson Talks It Over

ROBERT WOOD JOHNSON. Chairman of the Board, Johnson & Johnson. Bureau of Industrial Service, Inc., 285 Madison Ave., New York 17. 174 pp. Sketches. No charge.

This is a series of 44 informal talks by General Johnson to groups of plant workers to acquaint them with management's problems. An effort to do more than maintain "good labor-management relations," the talks are intended to keep the plant personnel acquainted with company policies, procedures, and international scope.

Rehabilitation of the Handicapped

Edited by **WILLIAM H. SODEN.** Exec. Asst., Physical Medicine Rehabilitation Service, Veterans Administration Hospital, Northampton, Mass. The Ronald Press Co., 15 E. 26th St., New York 10. 399 pp. Tables, charts, references, indexes of subjects and names. $5.

Procedures in current use for mental and physical rehabilitation of disabled or handicapped persons are reported here by a group of specialists. It is divided into five parts: General Medical and Surgical Techniques, Neurological Methods, Psychiatric Developments, Vocational and Social Rehabilitation, and Educational and Psychological Trends.

De Laval Engineering Handbook

Compiled by the Engineering Staff of the De Laval Steam Turbine Co., Trenton 2, N. J. Photographs, diagrams, sketches, formulas, tables, charts. $2.

This is a handbook of reference data, engineering information, and formulas. It is divided into six sections: mathematical, mechanical, and fluid information of a general nature; steam turbine data; centrifugal pump data; IMO pump, compressor, blower, and exhauster data; helical reduction gear data; and worm reduction gear data.

Working With People

AUREN URIS, Editor, Human Relations Div., and **BETTY SHAPIN,** Editor, Labor Relations Div., The Research Institute of America. The Macmillan Co., 60 5th Ave., New York. 311 pp. Tables, figures. $3.

Subtitled "Human Relations for the Plant and Office Supervisor." The study of human relations problems presented here is told in a semi-fictional style. The authors have included information on psychology, sociology, and anthropology as they apply to practical business problems. Each chapter deals with some specific aspect of human relations confronting management in the daily work routine.

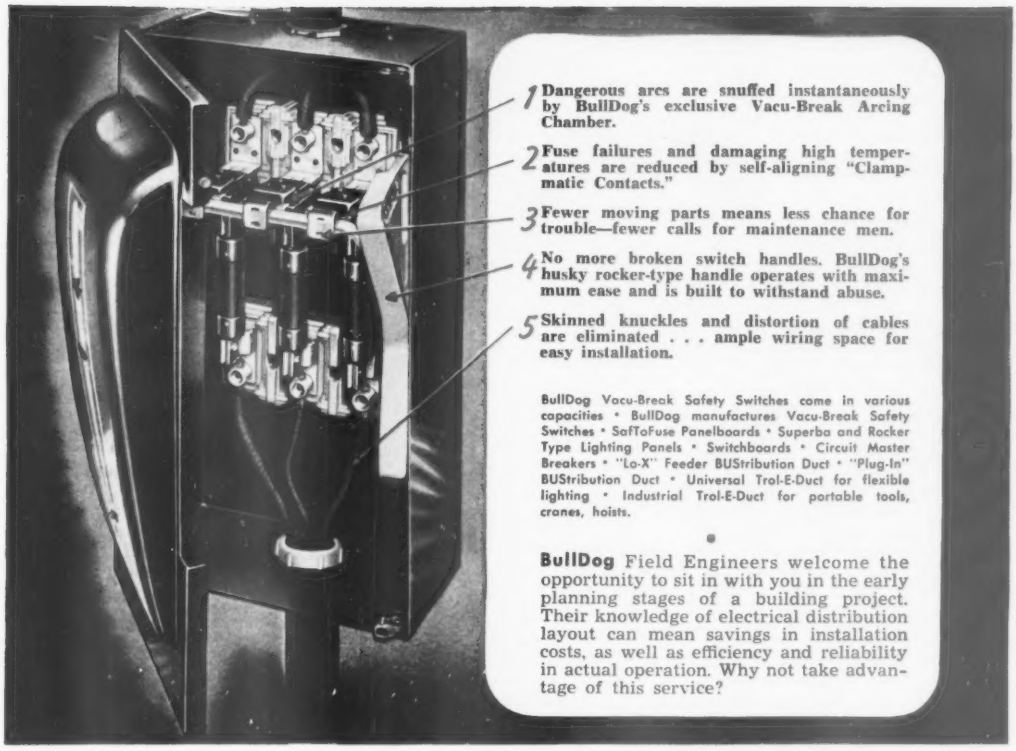
Steam Power Plants

PHILIP J. POTTER. Univ. of N. Dak. The Ronald Press Co., 15 E. 26th St., New York 10. 503 pp. Photographs, diagrams, tables, charts, appendix, index. $6.50.

Fundamentals of engineering as applied to the design of steam power plants are covered in this book. The discussion of equipment and methods is kept general, as the author points out that once the basic principles are mastered, trade differences can be worked out on the basis of specific problems involved.

Industrial Hygiene and Toxicology

Edited by FRANK A. PATTY, Director, Industrial Hygiene Service, General Motors Corp., Detroit, Mich. Interscience Publishers, Inc., 215 4th Ave., New York 3. Vol. II (review of Vol. I appeared in FACTORY, Feb., 1949). 1128 pp. Tables, charts, formulas, subject index for both Vols. I and II. $15.



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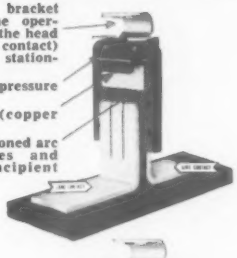
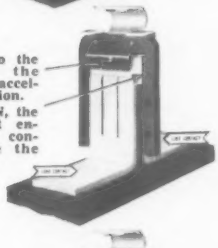
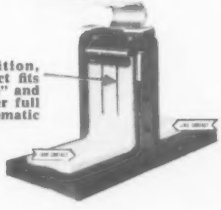


2 When operated to the OFF position, the Clampmatic spring accelerates disconnect action.

When operated to ON, the moving contact first engages the stationary contact prongs before the spring moves down.



3 In full ON position, the moving contact fits tightly between "Line" and "Load" contacts under full pressure by the Clampmatic spring.



The second of two volumes on this subject. Twenty articles prepared by specialists in their various fields analyze harmful industrial conditions and methods of applying control measures.

Welding and Cutting Manual

Published by The Linde Air Products Co., a unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York. 208 pp. Photographs, sketches, charts, tables, diagrams, glossary of welding terms, appendix, index. $1.80.

This is a reference book on the oxy-acetylene process. It includes instruction and step-by-step photographs of the procedure on actual repair jobs. Also included are: short-cuts for bronze-welding; fusion welding; soldering; hard-facing; cutting steel and cast iron; heating, forming, and straightening metals; welding and cutting pipe; and welding nonferrous metals.

BOOKLETS

PROBLEMS OF HOURLY RATE UNIFORMITY. John R. Abersold. Industry-Wide Collective Bargaining Series. Univ. of Pa. Press, 3446 Walnut St., Philadelphia 4. 60 pp. Tables. $1.

CAN LABOR AND MANAGEMENT WORK TOGETHER? Osgood Nichols and Thomas R. Carskadon. Public Affairs Pamphlet No. 151. The Twentieth Century Fund, 330 W. 42nd St., New York 18. 32 pp. Sketches, charts, bibliography. 20c.

INFORMATION FOR AMERICAN BUSINESSMEN ON THE MARSHALL PLAN. The Office of Information, Economic Cooperation Administraton, Washington 25, D.C. 30 pp. List of information sources, charts. No charge.

A BASIC MARKETING CHART OF THE U. S. Research Co. of America, 341 Madison Ave., New York 17. Single copies $2.50; lower prices for quantity orders.

IMPROVED INDUSTRIAL VISION—A Bonus for Management, A Benefit for Employees. American Optical Co., Southbridge, Mass. 24 pp. Photographs, sketches, charts. No charge.

OPERATING COST GUIDE for estimating cost of ownership and operation of power shovels, hoes, draglines, clamshells, and cranes. Power Crane & Shovel Assn., 74 Trinity Pl., New York 6. 24 pp. Sketches, charts, tables. 50c.

PAPERS PRESENTED AT THE FIRST SHORT COURSE ON INDUSTRIAL PACKAGING AND MATERIALS HANDLING. Bul. No. 57, Vol. 46. Engineering Experiment Station Circ. Series No. 56. Univ. of Ill., Urbana, Ill. 248 pp. Photographs, diagrams, specimen forms, tables. $1.

STEEL ELECTRICAL RACEWAYS—Rigid Steel Conduit; Electrical Metallic Tubing. American Iron & Steel Inst., 350 5th Ave., New York 1. 131 pp. Sketches, tables, diagrams. $1.

SURVEY OF UNIVERSITY BUSINESS AND ECONOMIC RESEARCH PROJECTS. Lyle C. Bryant, Extension Service, Small Business Div. A compilation of studies in business and economics recently completed or in process in university schools of business and de-

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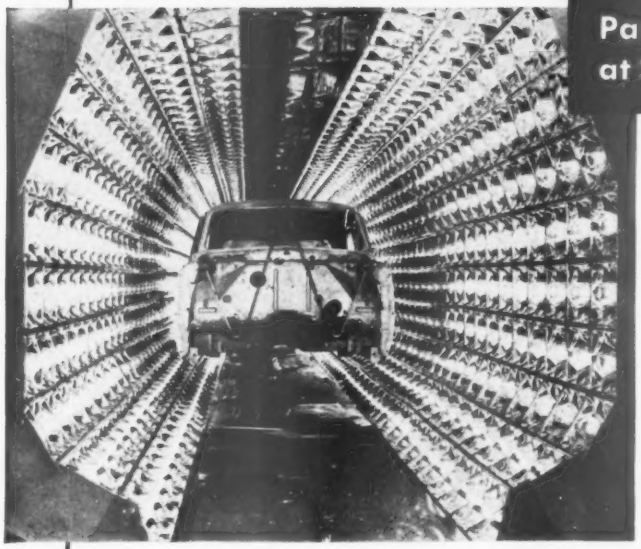

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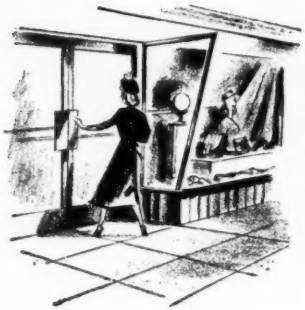

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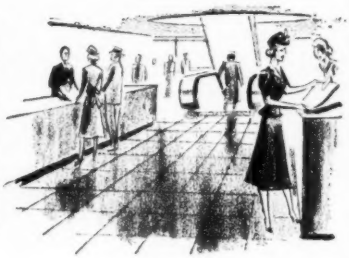

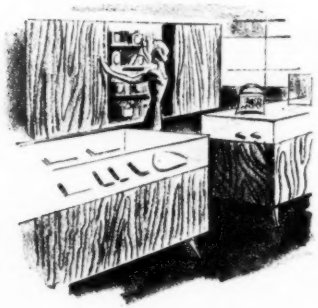

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partments of economics. Dept. of Commerce, Office of Domestic Commerce, Washington 25, D.C. 240 pp. Index of authors. $1.

APPRAISAL AND CONTROL OF DUPLICATING SERVICE. Management Bul. Executive Office of the President, Bureau of the Budget. Supt. of Documents, U. S. Gov. Printing Office, Washington 25, D.C. 44 pp. Specimen forms, tables, charts, appendix, index. 30c.

PROCEEDINGS OF THE FIRST ANNUAL NORTHERN CALIFORNIA RESEARCH CONFERENCE. Stanford Research Inst., Stanford, Calif. 68 pp. Charts, graphs, tables. $2.

PLANNING AND PREPARING THE EMPLOYEE INFORMATION MANUAL. Parts I and II. Report No. 585. The Dartnell Corp., Ravenswood and Leland Aves., Chicago 40. 100 pp. Exhibits, specimen forms, tables, charts, index. $7.50.

DEVELOPING RESOURCES FOR FINANCIAL EXPANSION. Financial Management Series No. 92. American Management Assn., 330 W. 42nd St., New York 18. 32 pp. 75c.

THE PUBLIC RELATIONS OF PROFITS. Financial Management Series No. 93. American Management Assn., 330 W. 42nd St., New York 18. 30 pp. Charts. 75c.

OPERATING UNDER DECENTRALIZED MANAGEMENT and **NEW GOALS IN ECONOMIC AND LABOR POLICIES.** General Management Series No. 144. American Management Assn., 330 W. 42nd St., New York 18. 31 pp. Charts. 75c.

A TRADE UNION LIBRARY—1949. Prepared by Hazel C. Benjamin, Librarian, Industrial Relations Section, 5th ed. Industrial Relations Section, Princeton Univ., Princeton, N.J. 54 pp. 75c.

KODAK DATA BOOK ON SLIDES. 4th ed. Eastman Kodak Co., Rochester 4, N.Y. 50 pp. Photographs, tables, formulas, charts. 35c.

A MANUAL OF TIMESTUDY FOR SUPERVISORS. Robert L. Thomas, II.S. Robert L. Thomas, 4409 Abbott Ave. N., Minneapolis 22, Minn. 91 pp. Tables, sketches, charts, specimen forms. $2.

TRAINING OF TRADES UNION OFFICIALS. Conference Series 8. British Institute of Management, 17 Hill St., London, W.1., England. 30 pp. 2/6.

INDICES OF PRODUCTIVITY. Conference Series 9. British Institute of Management, 17 Hill St., London, W.1., England. 2/6.

STANDARD TERMINOLOGY. Conference Series 7. British Institute of Management, 17 Hill St., London, W.1., England. 2/6.

THE V. I. STORY—VARNISHED INSULATIONS IN ELECTRICAL ENGINEERING. David O. Woodbury. National Electrical Mfrs. Assn., 155 E. 44th St., New York 17. 88 pp. Photographs. $1.

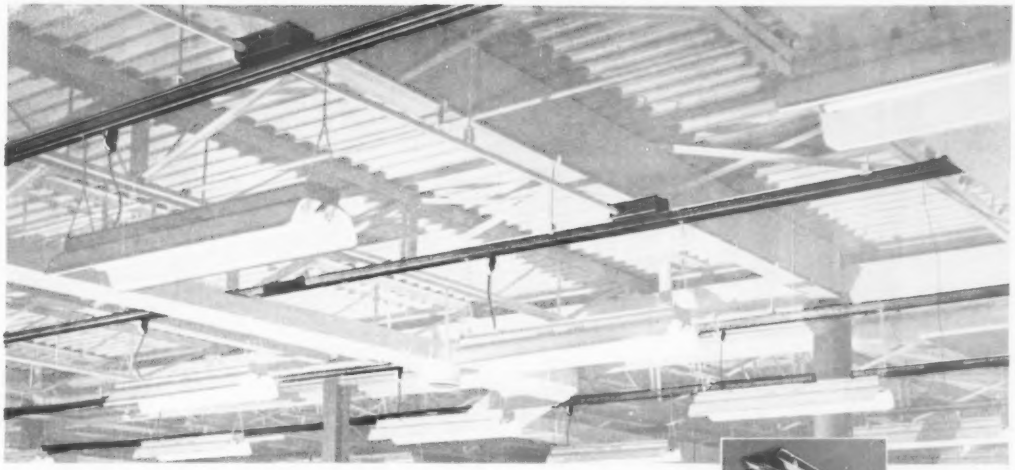
ON THE CALENDAR

OCTOBER

3-7, Packaging and Materials Handling Institute; Wayne University, School of Business Administration. Dr. Spencer A. Larsen, Chairman, Wayne University, Detroit.

3-5, National Lubricating Grease Institute, Annual Meeting; Hotel Roosevelt, New Orleans. Harry F. Bennetts, Executive Secretary, 4638 Mill Creek Pkwy., Kansas City 2, Mo.

3-6, Association of Iron and Steel Engineers, Annual Convention; Hote-



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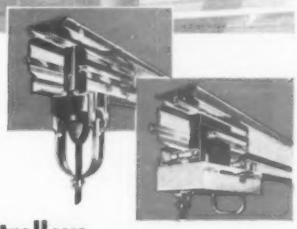

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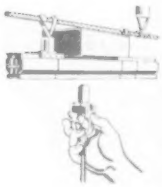

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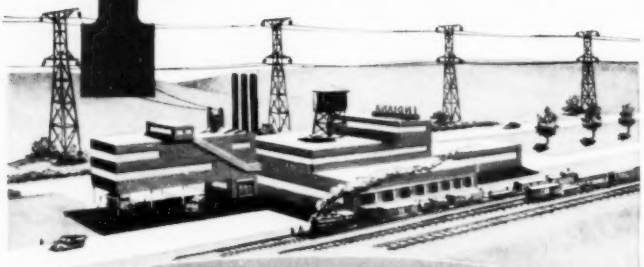

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William Penn, Pittsburgh. T. J. Ess, Managing Director, Empire Bldg., Pittsburgh.

4-7, Society of Industrial Packaging and Materials Handling Engineers, 4th Annual Industrial Packaging and Materials Handling Exposition; Convention Hall, Detroit. C. J. Carney, Jr., Managing Director, 20 W. Jackson Blvd., Chicago 4.

10-14, American Society for Testing Materials, 1st National West Coast Meeting; Fairmont Hotel, San Francisco. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

11-14, American Standards Association, Annual Meeting; Waldorf Astoria, New York. Vice Adm. George F. Hussey, Jr., USNR, Secretary, 70 E. 45th St., New York 17.

17-21, American Institute of Mining Engineers, Fall Meeting, Metals Branch; Public Auditorium, Cleveland. E. J. Kennedy, Jr., Assistant Secretary, 29 W. 39th St., New York 18.

17-21, American Society for Metals, 31st National Metals Exposition and Congress; Public Auditorium, Cleveland. W. H. Eisenman, Secretary, 7301 Euclid Ave., Cleveland 3.

17-21, American Welding Society, Annual Meeting; Public Auditorium, Cleveland. M. M. Kelly, Secretary, 33 W. 39th St., New York 18.

17-21, Society for Non-Destructive Testing, Annual Meeting; Public Auditorium, Cleveland. Walter Morrison, 7301 Euclid Ave., Cleveland 3.

17-21, National Association of Manufacturers, 18th Institute on Industrial Relations; The Greenbrier Hotel, White Sulphur Springs, W. Va. S. S. Patterson, Assistant Director, 14 W. 49th St., New York 20.

17-23, American Institute of Electrical Engineers, Fall General Meeting; Netherlands Plaza Hotel, Cincinnati. H. H. Henline, Secretary, 29 W. 39th St., New York 18.

17-Dec. 9, Management Problems for Executives, 3rd Session; University of Pittsburgh. E. C. Stone, Coordinator, School of Business Administration, University of Pittsburgh, Pittsburgh 13.

18-19, California Personnel Management Association, 22nd Pacific Coast Management Conference; Claremont Hotel, Berkeley, Calif. A. B. Tichenor, President, 442 Flood Bldg., San Francisco 2.

24-25, National Association of Suggestion Systems, National Fall Conference; Hotel Statler, Cleveland. F. A. Denz, President, 122 S. Michigan Ave., Chicago 3.

24-26, Packaging Institute, 11th Annual Forum; Hotel Commodore, New York. Dr. L. V. Burton, Executive Director, 342 Madison Ave., New York 17.

24-28, National Safety Council, 37th National Safety Congress and Exposition; Stevens, Congress, and Morrison Hotels, Chicago. R. L. Forney, General Secretary, 20 N. Wacker Dr., Chicago 6.

26-27, National Conference on Industrial Hydraulics, 5th Annual Convention; Sheraton Hotel, Chicago. Otto J. Maha, Conference Director, Hannifin Corp., Chicago.

26-28, National Metal Trades Association, Annual Convention; Palmer House, Chicago. Homer D. Sayre, Commissioner, 122 S. Michigan Ave., Chicago 3.

27-29, American Society of Tool Engineers, Montreal, Quebec. Harry E.

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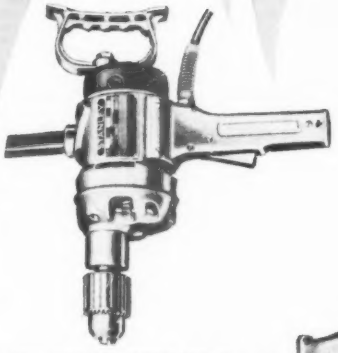

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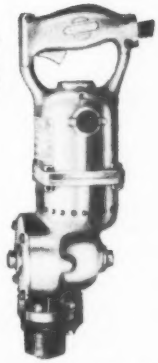

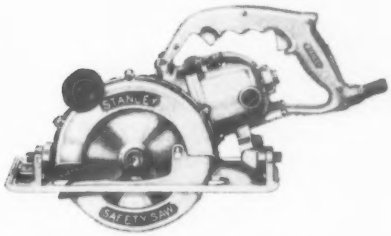

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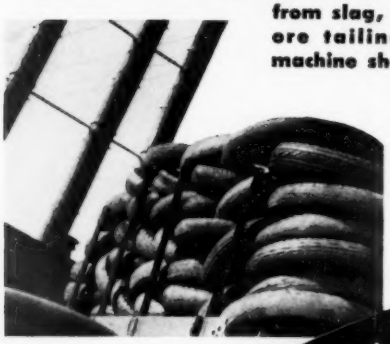

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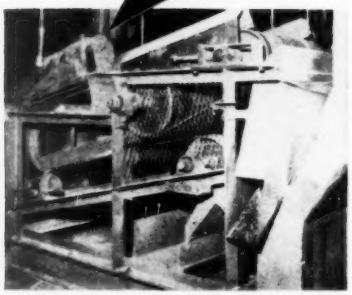

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Conrad, Executive Secretary, 10700 Puritan Ave., Detroit 21.

31-Nov. 2, Packaging Machinery Manufacturers' Institute, 17th Annual Meeting; Edgewater Beach Hotel, Chicago. H. L. Stratton, 342 Madison Ave., New York.

31-Nov. 3, American Institute of Accountants, Annual Meeting; Biltmore Hotel, Los Angeles. John Carey, Executive Director, 13 E. 41st St., New York.

NOVEMBER

1-5, American Chemical Society, 2nd Biennial Pacific Chemical Exposition; San Francisco Civic Auditorium Marcus W. Hinson, Manager, Hotel Whitcomb, San Francisco 1.

3-4, The Society for the Advancement of Management, Annual Conference; Hotel Statler, New York. Dillard E. Bird, President, 84 William St., New York.

10-11, American Management Association, Production Conference; Palmer House, Chicago. Fred Schneider, Conference Manager, 330 W. 42nd St., New York 18.

13-18, National Electrical Manufacturers' Association, Annual Meeting; Chalfonte-Haddon Hall, Atlantic City. R. J. Blais, Convention Manager, 155 E. 44th St., New York.

14-18, Refrigeration Equipment Manufacturers' Association, 6th All-Industry Air Conditioning and Refrigerating Exposition; Atlantic City Auditorium. R. K. Hanson, Director, 1107 Clark Bldg., Pittsburgh 22.

27-Dec. 2, American Society of Mechanical Engineers, Annual Meeting; Hotel Statler, New York, Ernest Hartford, Executive Secretary, 29 West 39th St., New York 18.

28-Dec. 3, 22nd Exposition of Chemical Industries; Grand Central Palace, New York. Charles F. Roth, Manager, 480 Lexington Ave., New York.

DECEMBER

1-2, American Leather Belting Association, Annual Meeting; Hotel Commodore, New York. E. R. Rath, Executive Vice-President and Secretary 41 Park Row, New York.

2, Society for the Advancement of Management 2nd Annual Regional Discussion Conference; Warwick Hotel, Philadelphia. A. L. Mettler, General Chairman, The Electric Storage Battery Co., Philadelphia 22.

1-7, The American Society of Refrigerating Engineers, Annual Meeting; Edgewater Beach Hotel, Chicago. M. C. Turpin, Secretary, 40 W. 40th St., New York.

7-9, National Association of Manufacturers, 54th Congress of American Industry; Waldorf-Astoria, New York. Lawrence D. Marks, Director, 14 W. 49th St., New York 20.

8-10, American Institute of Mining Engineers, 7th Annual Conference; Pittsburgh. Dr. Ernest Kirkendall, Assistant Secretary, 33 W. 39th St., New York 18.

29-30, American Chemical Society, Christmas Symposium on Absorption and Extraction; Columbus, O. Dr. Lincoln T. Work, Metal & Thermit Corp., Rahway, N.J.

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Silicone News

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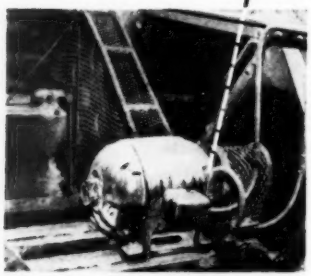

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Photo courtesy Standard Gypsum Company of California

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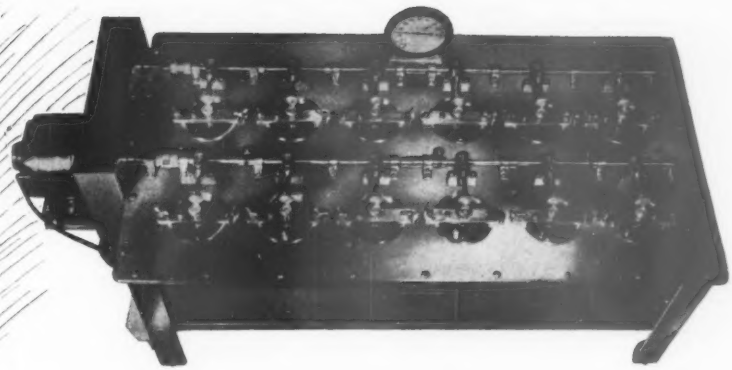

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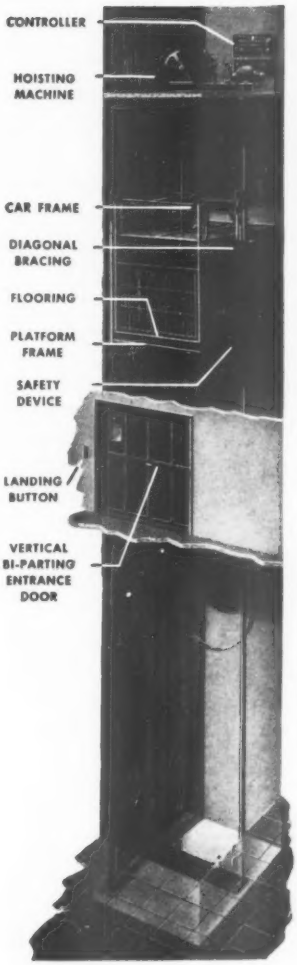

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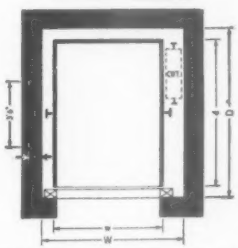
. . . require hoistways that can also take power truck 'punishment.' All forces caused by impact, off-balance and extra static loading are transferred to the rails, rail brackets, rail backing, and finally, to the building framework. New buildings should be provided with extra strength; old buildings must be reinforced. The design and installation of structural steel, and all changes in the building structure, are the responsibility of the building owner. OTIS supplies and installs the rails, rail fastenings and the beams upon which the hoistway machine rests. To insure proper coordination of effort, OTIS representatives will work in close cooperation with your architects and building engineers. OTIS Pow-R-Truck Freight Elevators are fully standardized. They cost only slightly more than conventional freight elevators. For further information write for Bulletin B-705-R.

For details of the new OTIS Self-Supporting Elevator—a light duty electric freight elevator that requires no penthouse, no overhead supports, no building reinforcing—write for Bulletin B-720-R.



Space for rail reinforcing at "X" may or may not be required, depending on hoist-way construction.

Recommended Sizes and Capacities of Pow-R-Truck Elevators

PLATFORM SIZE		HOISTWAY DIMENSIONS																					DOOR
Width	Depth	8,000 lb. Capacity			10,000 lb. Capacity			12,000 lb. Capacity			14,000 lb. Capacity			16,000 lb. Capacity			18,000 lb. Capacity			20,000 lb. Capacity			Clear Opening
w	d	W	D	X	W	D	X	W	D	X	W	D	X	W	D	X	W	D	X	W	D	X	
8'-4"	10'	10'-6"	11'	3"	10'-6"	11'	3"																8'
8'-4"	12'	10'-6"	13'	3"	10'-6"	13'	3½"	10'-8"	13'	3½"													8'
8'-4"	14'	10'-6"	15'	3½"	10'-6"	15'	3½"	10'-8"	15'	4"	10'-10"	15'	4"	11'	15'	8"							8'
8'-4"	16'	10'-6"	17'	4"	10'-6"	17'	4"	10'-8"	17'	4"	10'-10"	17'	4"	11'	17'	8"	11'-2"	17'	8"	11'-4"	17'	8"	8'
10'-4"	14'	12'-6"	15'	4"	12'-6"	15'	4"	12'-8"	15'	4"	12'-10"	15'	4"	13'	15'	8"	13'-2"	15'	8"	13'-4"	15'	8"	10'
10'-4"	16'				12'-6"	17'	4"	12'-8"	17'	4"	12'-10"	17'	8"	13'	17'	8"	13'-2"	17'	8"	13'-4"	17'	10"	10'
10'-4"	20'							12'-8"	21'	8"	12'-10"	21'	8"	13'	21'	10"	13'-2"	21'	10"	13'-4"	21'	10"	10'
12'-4"	16'										14'-10"	17'	8"	15'	17'	10"	15'-2"	17'	10"	15'-4"	17'	10"	12'

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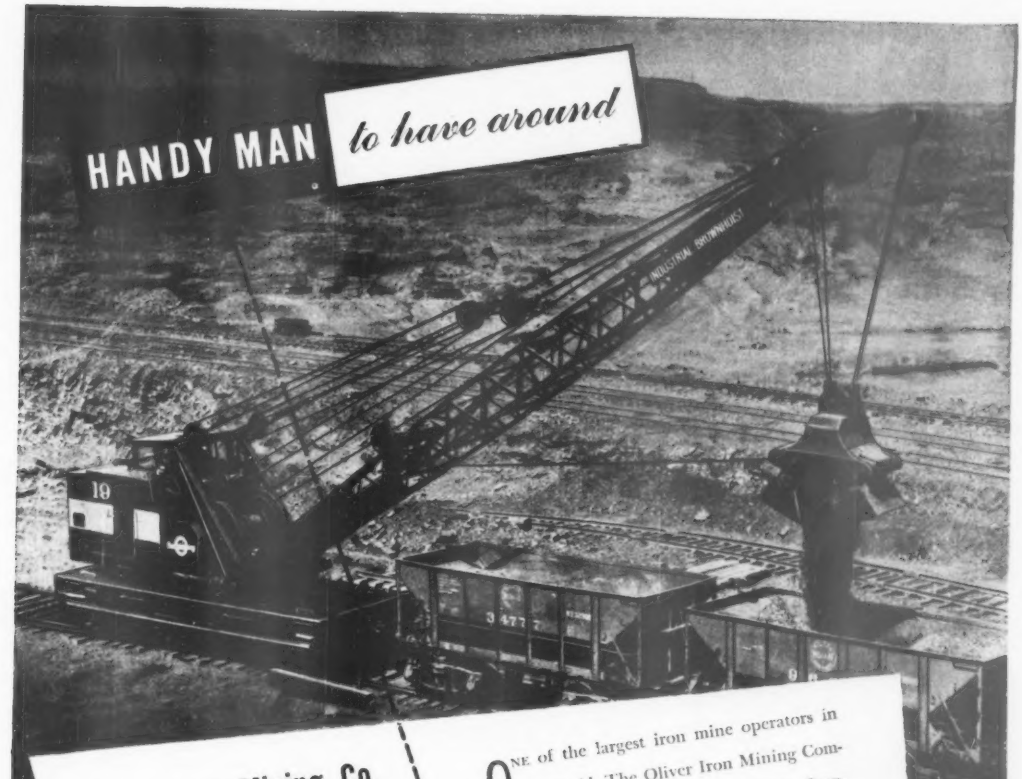
ENGINES, DUAL-FUEL DIESEL



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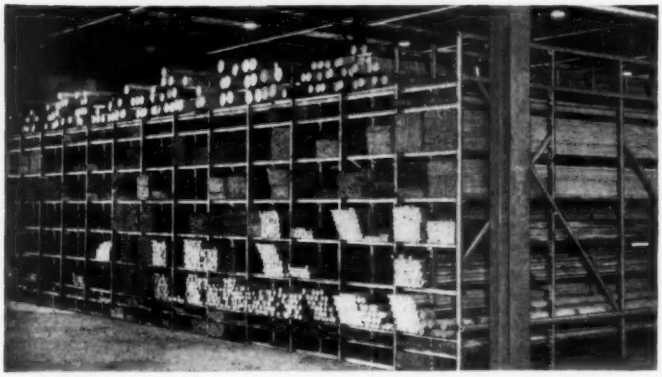

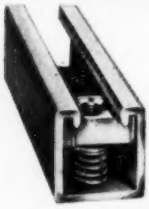

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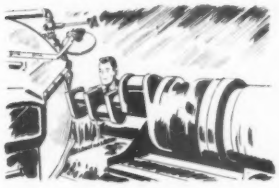

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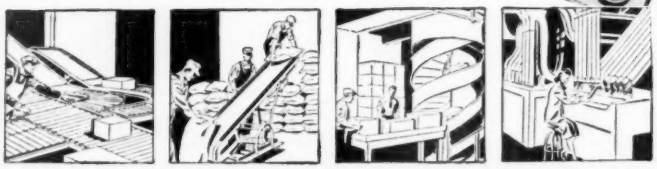

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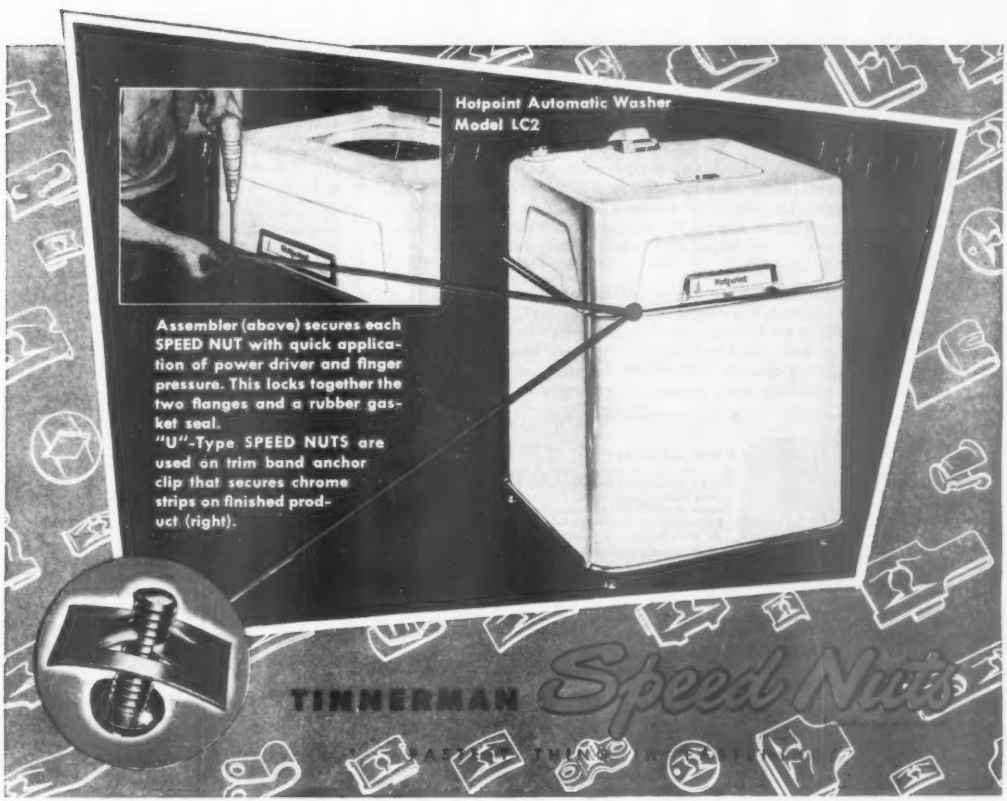
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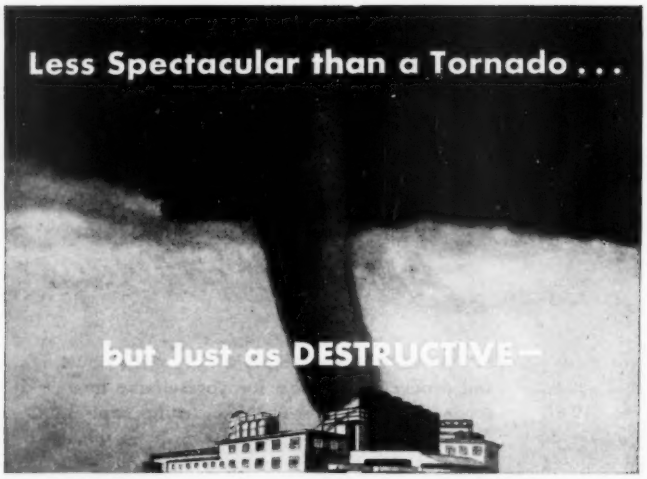

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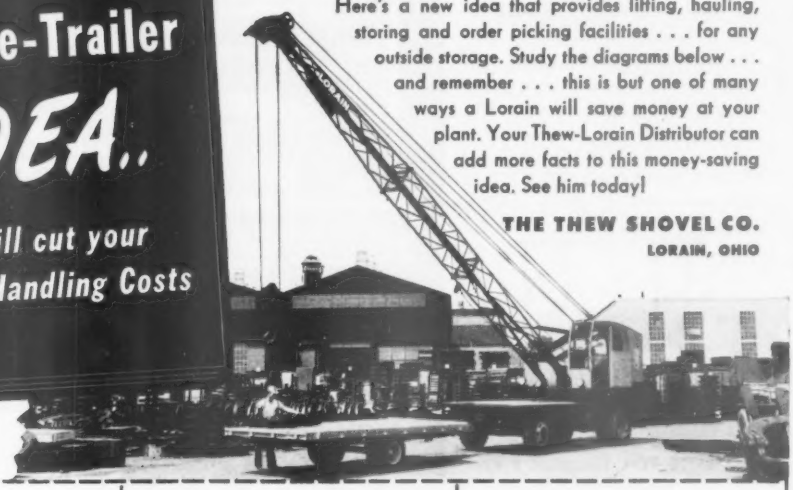
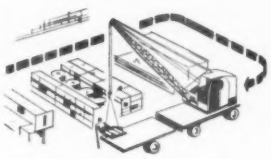


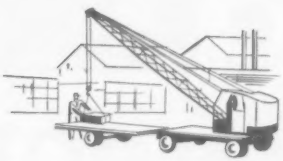


1. MAKE A YARD PLAN

Make a plan for storage . . . numbered bays, wider aisles, higher stacking. Storage sections can be as wide as 70 ft. with 35 ft. crane reach. You'll cut down lost space with the far-reaching Crane boom.

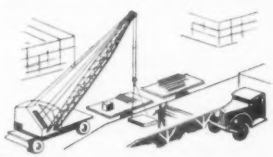
2. PLAN YOUR PICK-UP CYCLE

The "picker" arranges requisition lists in order, according to aisles and bay numbers. Then the Lorain Crane follows the "picker" on a planned cycle of the yard . . . back-tracking is avoided.



3. IT'S ONLY A 2-MAN JOB

Your order picker does double-duty. He signals the Crane operator . . . and is the hook-man, too. Parts are unhooked on the trailer from the ground . . . no climbing hazards . . . no lost time.

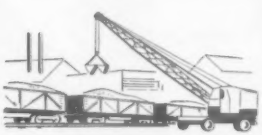


4. CRANE UNLOADS TRAILER, TOO

PUSH or PULL the trailer to the shipping dock via Lorain 8 m.p.h. mobility. Then the Crane that transports also unloads the trailer at the dock for sorting, crating, shipping.

5. MULTIPLE TRAILER OPERATION

When the Crane is busy . . . or off duty . . . load up several "stand-by" yard trailers. When Crane is available, couple to the trailers and dispatch loads. Saves unloading to temporary ground storage and later reloading to trailers.



6. BONUS SAVINGS EVERY DAY

When free from trailer duty your Lorain Crane is available to load or unload sand, coal, steel, lumber . . . handle plant construction and maintenance.

MORE FOR YOUR $ IN A LORAIN

THEW Lorain
CRANES FOR INDUSTRY

Send for Free Folder . . .

THE THEW SHOVEL CO.
LORAIN, OHIO

Send illustrated folder, showing how Lorain Cranes are cutting material handling costs for others.

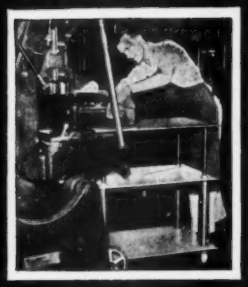
Name_____
Title_____
Address_____
City_____ State_____

A WAY TO LOWER UNIT COSTS

INSTALL PORTELVATOR

(THE HAMILTON PORTABLE ELEVATING TABLE)

Portelvator increases production by accomplishing the muscle jobs easily. Eliminates ganging up on heavy lifts. Reduces strains and bruises to office frequency. Buy this brawny helper for each machine, and then . . . "Send one man, and Portelvator".



- Raises — lowers — transports.
- Levels and supports overhanging work.
- Forms a work bench when and where you need it.
- *May be worked at from all sides.*
- One man can *safely* lift and carry loads usually requiring the combined strength of four.
- Three table surfaces.
- *Four point support.*
- Minimum Maintenance — Compare!
- Fast lift and slow lift mechanism.
- Self locking at any height.
- Positive floor lock.
- Standard model capacities 1,000 to 5,000 pounds.
- Special models designed and built on order.

WRITE FOR BULLETIN P-47

THE Hamilton TOOL COMPANY

906 HANOVER STREET · HAMILTON · OHIO · U · S · A

REMOTE Production Control

The Production Manager's Dream Fulfilled—

Continuous, up-to-the-second individual count of PRODUCTION from hundreds of machines or operations right in the Production Control Office. Check idle machines or time study any number of operations unobserved. Totalize and compare output from hundreds of machines in minutes. Wizard Electric Counters panel mounted in compact self-supporting cabinet assemblies. Count anything that will operate electric switch or photo electric unit. Send for Bulletin PEC-40.

Catalog covering Modern Counting Devices for all applications — Send for your copy.

Production Instrument Company

700-06 W. JACKSON BLVD., CHICAGO 6, ILL.

REPRESENTATIVES IN PRINCIPAL CITIES

sizes, kits. North Bros. Mfg. Co., Div. of Stanley Tools.

—88—

SILICATES—Definitions, grades, uses of different types; specifications; charts of specific gravity, temperature correction. 20 pp. Diamond Alkali Co.

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SPRAY GUN FOR HARD-FACING ALLOYS—called Spraywelder. What it is, how to use it, properties of alloys used with it. Applications; equipment, facilities needed. Photographs. Wall Colmonoy Corp.

—90—

STAPLING MACHINE—Automatic, electric, instantaneous operation. Features, specifications. The Staplex Co.

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STARTERS, MOTOR—Types, sizes, enclosures; protective features; applications. Description, range, photographs. Allis-Chalmers Mfg. Co.

—92—

STEEL, ALLOY—"How to Specify and Buy Alloy Steel with Confidence," 24 pp. Description of different types, recommended selection procedures, characteristics, specifications. Photographs, tables. Joseph T. Ryerson & Son, Inc.

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STEEL, COATED — "Fabricating and Finishing of Armco Zincgrip-Paintgrip." 12 pp. Recommended methods for forming, joining, painting; welding, cleaning, storing. Photographs, sketches. Armco Steel Corp.

—94—

STEEL, COATED—Hot-dip zinc-coated steel, called Galvanite. Uses, manufacture, characteristics. Photographs, sketches. 12 pp. Sharon Steel Corp.

—95—

SWITCH, SPLASHPROOF—with stainless steel plate actuator. Construction, characteristics, rating. Suggested uses, installation data. Photographs. Micro Switch, Div. of First Industrial Corp.

—96—

SWITCHES, SAFETY—heavy-duty, enclosed. Features, construction, ratings, applications. Photographs of components. The Trumbull Electric Mfg. Co.

—97—

THERMOMETER, RECORDING—called Traveling-Oven. Description of use with various types of conveyor ovens. Photographs, chart records, specifications, prices. Bul. T842. The Bristol Co.

—98—

THERMOMETERS—indicating and recording. Descriptions, specifications for 5 types; bulbs, fittings. The Electric Auto-Lite Co., Instrument & Gage Div.

—99—

TOOLS, MACHINES, HARDWARE—Description; illustrations. "How to use" data. Cat. 20, 84 pp. Red Devil Tools.

—100—

TOOLS, PIPE—hand and electric, for cutting and threading pipe, bolts, conduit. Photographs, cross-sectional drawings; step-by-step procedure; specifications. Cat. 49. Beaver Pipe Tools, Inc.

—101—

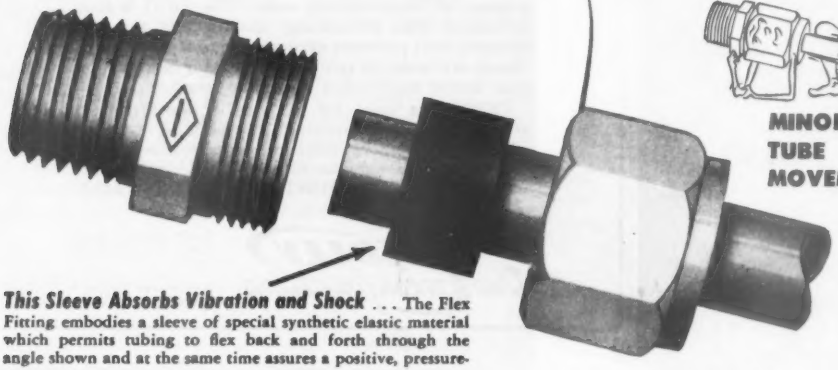
TUBE-FITTING SHAPES — and parts, 8½x11-in. display card lists names, illustrates shapes. Size numbers, dimensions, pipe threads, code designations. The Parker Appliance Co.

—102—

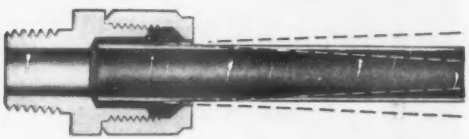
VALVES, PRESSURE RELIEF—for tanks, processing equipment; safety heads, flanges, rupture disks; automatic chemical feeders; vent valves. Photographs, drawings, descriptions. Black, Sivalls & Bryson, Inc.

IMPERIAL FLEX FITTINGS

for connecting tubing where there is

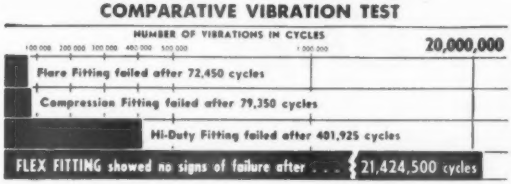


This Sleeve Absorbs Vibration and Shock . . . The Flex Fitting embodies a sleeve of special synthetic elastic material which permits tubing to flex back and forth through the angle shown and at the same time assures a positive, pressure-tight seal.



Flex Fitting Makes Joints Virtually Indestructible by Vibration . . . On tests where ordinary fittings failed after 73,000 cycles of vibration, Imperial Flex Fittings have withstood over 20,000,000 cycles without failure as indicated in the chart below:

COMPARATIVE VIBRATION TEST


NUMBER OF VIBRATIONS IN CYCLES
100,000 200,000 300,000 400,000 500,000 1,000,000
20,000,000
Flare Fitting failed after 72,450 cycles
Compression Fitting failed after 79,350 cycles
Hi-Duty Fitting failed after 401,925 cycles
FLEX FITTING showed no signs of failure after . . . 21,424,500 cycles

For All Kinds of Tubing. . . Imperial Flex Fittings can be used with all types of seamed and seamless metal tubing, including copper, aluminum, thin-wall steel, monel, stainless steel, etc.

Easy to Install . . . All that is necessary is to slip nut and Flex sleeve over tubing. Then insert tubing into fitting body as far as it will go, and assemble. On sizes larger than ½" O.D. and where higher pressures are involved, end of tubing should be belled slightly.

Proved by Extensive Use in the Field . . . Used as standard equipment on trucks, tractors, diesel engines, oil filter connections, heavy power equipment, machinery, etc.

See Your Industrial Supply House

CATALOG No. 344-C gives complete engineering data on Flex Fittings including types, sizes, dimensions, specifications and applications. *Write for your copy.*

THE IMPERIAL BRASS MFG. CO., 517 S Racine Ave., Chicago 7, Ill.

IMPERIAL

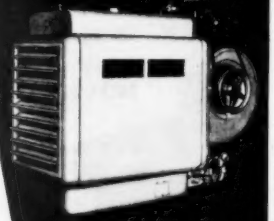
PIONEERS IN TUBE FITTINGS AND TUBE WORKING TOOLS

Humphrey

announces

A COMPLETE NEW LINE OF...

ROTOR TYPE



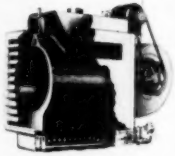
GAS UNIT HEATERS

- NEW Burner Design
- NEW Heat Exchanger
- NEW Modern Styling
- NEW Positive Safety Controls

A compact, automatic, self-contained heating plant effective with or without ducts. Clean, economical heat that eliminates steam and water lines, boilers and fuel shortage worries. Ceiling suspension.

DEPENDABLE

Trouble-free operation and maximum heat is assured by many exclusive Humphrey features.



Write for Complete Specifications

GENERAL GAS LIGHT CO.
KALAMAZOO, MICHIGAN

For The Smaller Washrooms
Select
DUO-Washfountains

The Bradley DUO is a compact modern wash fixture that takes the place of TWO ordinary "single-person" washbasins. It serves two persons simultaneously with a spray of clean running water. The DUO is foot-controlled thus eliminating faucets; and the self-flushing bowl prevents accumulations of dirty water. Hands are never in contact with contagious surfaces thus health is afforded maximum protection.

DUOS are ideal for the smaller washroom or wherever extra, economical wash facilities are needed; in plant kitchens, entrances to cafeterias, laboratories, and at selected locations throughout the plant. BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan Street, Milwaukee 1, Wisconsin.

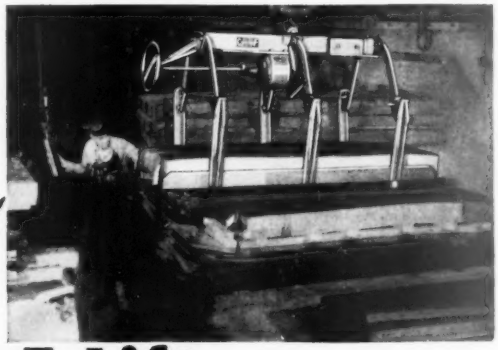
BRADLEY Duo Washfountains

Catalog 464-D Gives Complete Details. Write Today.

Distributed Through Plumbing Wholesalers.

One man

and



a C-F Lifter...

One man and a C-F Lifter handle the sheet steel stock in and out of storage in this plant with ease, speed and economy. C-F Lifters can pick up, carry and unload more loads per hour using less man and crane time than any other method. Note how closely a C-F Lifter piles sheets—this results in great savings in storage space. Jaw adjustments for carrying different widths of sheets are made in a few seconds by the operator—an important feature when varying sizes of stock are used.

C-F Lifters are made in sizes to handle from 2 to 60 tons in standard and semi-special designs.

Write for the bulletin "C-F Lifters." It illustrates the many cost-saving advantages of these lifters.

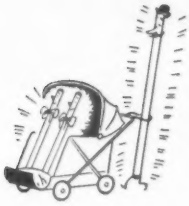
CULLEN-FRIESTEDT CO.
1321 S. Kilbourn Ave., Chicago 23, Ill.

HANDLE SHEETS with C-F LIFTERS

LIGHTING NEWS

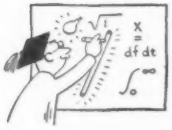
New lamps—new uses—money-saving ideas

FROM G-E LAMPS



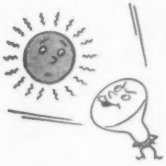
TWO NEW SLIMLINE LAMPS are now available from G.E. in the new 1½ inch diameter that gives more light per foot than standard slimline fluorescents. 4 ft. and 6 ft. long, these two new T-12 lamps are designed as companions to the 8 ft. T-12 recently announced. Like all slimlines, they need no starters - start instantly - require minimum maintenance - have long life. Write for your free copy of "Modernize with G-E Slimlines." General Electric Div. 166-F10, Nela Park, Cleveland 12, Ohio.

TELL-TALE REFLECTIONS SPEED AUTO OUTPUT. A better way to inspect the finish of automobiles has been developed by General Electric lighting experts for a large automobile manufacturer. As cars pass between vertical banks of fluorescent lamps, inspectors watch lamp reflections on car bodies. Rippled reflection indicates a slight dent or paint imperfection. Company reports new method saves time and is much more accurate.



DO YOU HAVE A SPECIAL LAMP PROBLEM? For inspection? Signaling? Drying? Or a tough spot to light? Your G-E Lamp supplier can help you find just the right bulb and the right equipment to do the job. He is supported by the complete engineering service of General Electric lighting engineers. See your G-E supplier or write to General Electric.

PRICES REDUCED ON PHOTOFLASH LAMPS. General Electric has just made an across-the-board retail price reduction on all photoflash lamps. Price reduction—made possible by increased volume—brings prices in most cases down to pre-war levels or below. The No. 5 midget, most popular size, has been reduced from 14c to 12c.



NEW PHOTO LAMP SEVEN TIMES BRIGHTER THAN SUN. New opportunities to study machinery vibration and other types of rapid action are opened up by a new General Electric photographic floodlight. Producing light 7 to 15 times the intensity of noonday sunlight at distances up to 18 inches, it was designed by G-E engineers especially for high-speed motion pictures of small objects. Needs no auxiliary equipment, fits ordinary socket, operates on normal voltages.

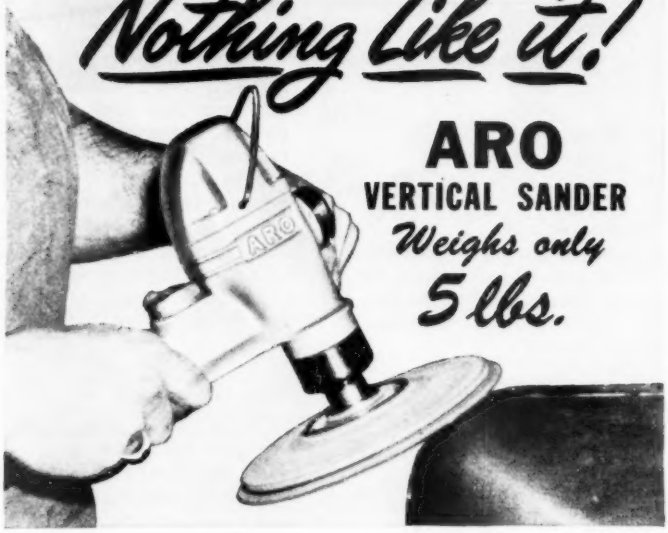
"SPLASH-PROOF" INFRARED LAMP ANNOUNCED. A new heat lamp that resists breakage from splashing liquids has just been announced by General Electric. Rated 375 watts, the new lamp is made of heat-resistant glass, can operate in high-temperature ovens. For details on G-E infrared lamps, write for free booklet, "Bake, Dry, Heat with G-E Industrial Infrared Lamps." General Electric, Nela Park, Div. 166-F10, Cleveland 12, Ohio.

For more data on the items above and for complete information on lamps and lighting, phone your local General Electric Lamp Dept. office.

You can put your confidence in—

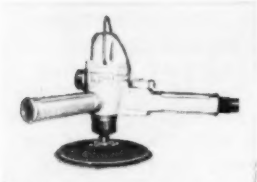
GENERAL ELECTRIC

IT'S *New!* *Nothing Like it!*

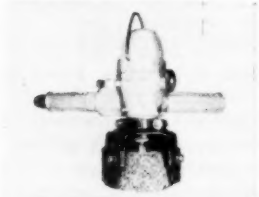


ARO VERTICAL SANDER

Weighs only 5 lbs.



CORRECT ANGLE of handle in relation to motor housing insures true balance . . . easy handling. Model 7025.



4" CUP GRINDING WHEEL AND GUARD used for top-speed work with Aro Model 7194.

5" CUP WIRE BRUSH ideal for rust removal and similar jobs with Aro Model 7195.

More Power Per Pound

THAN ANY OTHER SANDER

- ★ TRUE BALANCE
- ★ CORRECT SANDING SPEED
- ★ LESS AIR PER H. P.

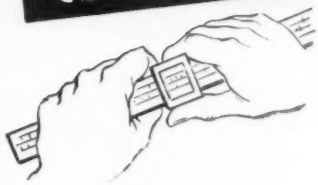
"Plenty of guts" for your toughest jobs! Gets the work done *faster* and *better!* New streamlined design . . . tough magnesium housing . . . governor controlled speed . . . new exhaust deflects and cools sanding pad . . . helical gears assure smoother operation and longer life. Choice of 7" backing pad, 4" cup grinding wheel with guard, or 5" cup wire brush. Write The Aro Equipment Corporation, Bryan, Ohio or see your nearest ARO distributor.

ARO

AIR TOOLS

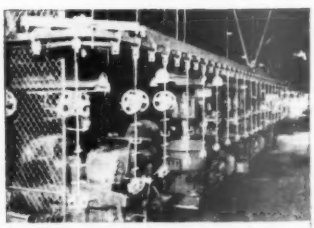
Also . . LUBRICATING EQUIPMENT . . HYDRAULIC EQUIPMENT . . AIRCRAFT PRODUCTS . . GREASE FITTINGS

Buschman TROLLEY CONVEYORS



"Custom-built installations"

AT "READY-MADE" PRICES



● Modernize . . . mechanize your production with Buschman Universal Cable Trolley Conveyors. Stock units at low cost can be adapted to your special needs with no disruption of production or present facilities. Easily installed from standard sections . . . completely field-bolted . . . require no welding.

For light and medium loads Cable Trolley Conveyors by Buschman are efficient, durable and far less costly than conventional chain conveyors. Buschman Engineers will gladly show you—at no cost—how the Universal Cable Trolley Conveyor can be "tailored" to your needs.

STANDARD STOCK UNITS

Smooth Running, Trouble Free Installation

3" T. JR. Track
Double Duty Trolleys on Steel Cable
Timken Bearinged Idler Sheaves
Variable Speed Drive
Vertical "S" Curve
Take Up Units

For full details, write for Bulletin 40.

Buschman *Conveyors*

THE E. W. BUSCHMAN CO., INC.
4425 Clifton Ave. Cincinnati 32, Ohio

SINGLE! DOUBLE! TRIPLE!

. . . Every type of Herringbone Speed Reducer that you might need

Jones Herringbone Gear Speed Reducers are built in a wide range of ratios and ratings to cover every requirement. Single (Type SH) reducers in standard ratios range from 1.25 to 1 up to 11 to 1 in ratings from 1.3 to 440 H.P. Double (Type DH) reducers are built in standard ratios from 10.9 to 1 up to 72 to 1 in ratings from 0.5 to 275 H.P. The triple reduction reducers (Type TH) cover a range of ratios from 86.9 to 1 up to 355.8 to 1 in ratings from 0.3 to 78 H.P.

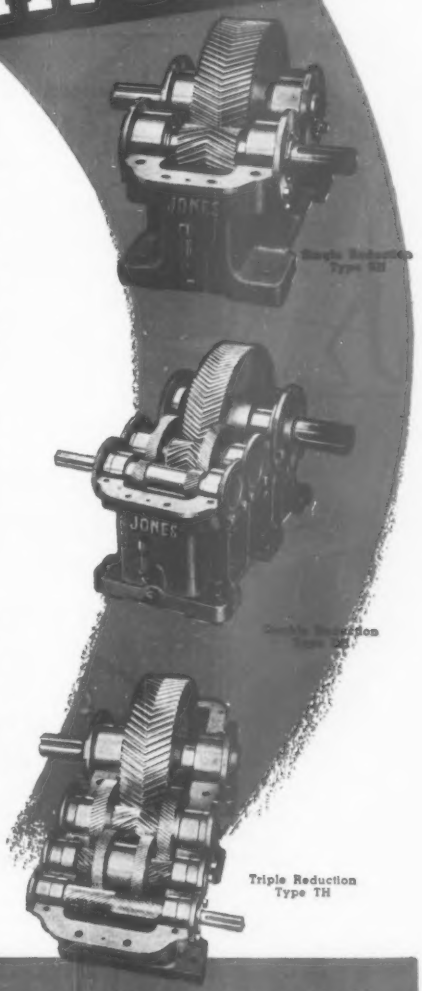
All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Cast iron bases are available for all variations of motor assembly. Liberal stocks are carried to facilitate shipments.

Here's Complete Information About the Application of Herringbone Reducers

This 128-page catalog of Jones Herringbone Reducers presents a vast amount of data relating to Herringbone Reduction Units. Illustrations show a broad range of herringbone reducer applications and the technical information shows how to select reducers for all conditions of service in accordance with the A.G.M.A. recommended practice.

Write for your free copy of this valuable treatise

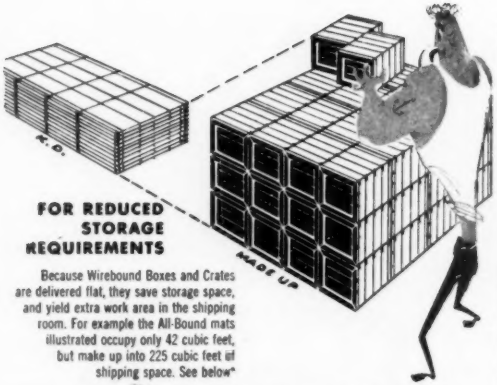
W. A. JONES FOUNDRY & MACHINE CO.
4433 Roosevelt Rd., Chicago 24, Ill.



Triple Reduction
Type TH

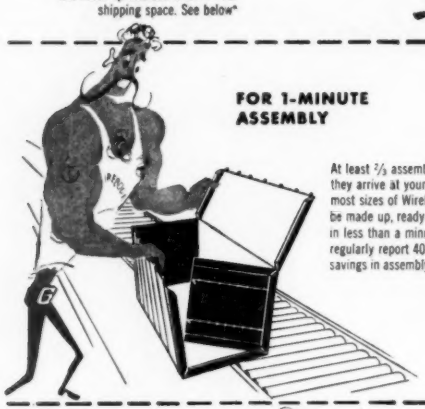
Jones

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
PULLEYS • GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • FLEXIBLE COUPLINGS



FOR REDUCED STORAGE REQUIREMENTS

Because Wirebound Boxes and Crates are delivered flat, they save storage space, and yield extra work area in the shipping room. For example the All-Bound mats illustrated occupy only 42 cubic feet, but make up into 225 cubic feet of shipping space. See below*



FOR 1-MINUTE ASSEMBLY

At least ⅔ assembled when they arrive at your plant, most sizes of Wirebounds can be made up, ready to pack in less than a minute. Users regularly report 40-50% savings in assembly time.*

FOR BETTER, SAFER STACKING

The versatility of the Wirebound principle—the strength of steel combined with thinner wood—permits variation of wire gauges, staple spacing, battens and cleats to provide safe structural strength for large and small containers to meet all warehousing requirements. Note*

USE Wirebound **BOXES & CRATES** FOR LOWER TOTAL SHIPPING COSTS

60 Wirebound Plants throughout the United States

***Send for this free book!** Explains in detail Wirebound principles, advantages, features and describes how Wirebounds are designed to suit every size and shape of product. Mail coupon today.*

Wirebound Box Manufacturers Assn., Room 1838 Borland Bldg., Chicago 3, Ill.

☐ Send Booklet of Product Information ☐ Send a Sales Engineer

NAME

COMPANY ADDRESS

CITY ZONE STATE

OUR PRODUCT IS

high ratios ?

✳ ONE OF 93

DE LAVAL DOUBLE REDUCTION WORM GEARS

De Laval double reduction speed reducers, consisting of combinations of double worm gear reductions, or helical and worm gear reductions, are available with overall ratios up to approximately 8000 to 1. De Laval single reduction worm gear speed reducers are available in ratios up to 90 to 1. If high ratios are your requirement, worm gear speed reducers are the answer—particularly if space is limited and reliability is important. A De Laval representative will help you pick the right size and type.

✳ This double reduction De Laval Worm Gear Speed Reducer is available in many standard ratio combinations, with horizontal or vertical output shafts and is but one of 93 sizes and types of standard De Laval Worm Gear Speed Reducers.

WG-14

DE LAVAL

Worm Gear Division: **De Laval Steam Turbine Co., Trenton 2, N.J.**

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS CENTRIFUGAL BLOWERS AND COMPRESSORS • IMO OIL PUMPS

HOW TO GET TWO FOR ONE ON YOUR FREIGHT ELEVATOR DOLLAR

EVERY WESTINGHOUSE FREIGHT ELEVATOR IS BUILT TO TAKE THE SUDDEN SHOCK OF POWER-TRUCK LOADING

With Westinghouse you get two for one on your freight elevator dollar . . . *and* you also get Westinghouse dependability and rugged, long-life performance in the vertical transportation of your heavy equipment and supplies.

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OPTONIC COLOR COMPASS

SENT
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Accurate and Dependable as a Slide Rule

POINTS *INSTANTLY* TO THE *PROPER* COLORS...

Sounds unbelievable...but it's true! This ingeniously designed 11-inch diameter calculator is based upon Arco's nationally-known Optonic Color System. Not a gadget or toy, the Optonic Color Compass is scientifically designed... bases its recommendations upon location of areas to be painted and the quantity and quality of natural and artificial light present therein.

MAKES SCIENTIFIC COLOR RECOMMENDATIONS...

With the Optonic Color Compass to guide you there's never any question regarding the proper color to apply to walls, ceiling, dado, sash or trim. Better still, when you follow the recommendations of the Optonic Color Compass, you are assured that the colors used are more than just pleasing to the eye... science has proved them to be restful, unfatiguing . . . *perfectly balanced.*

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ARCO

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INTERCHANGEABLE HUBS

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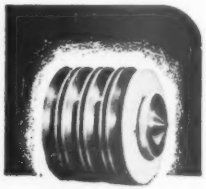

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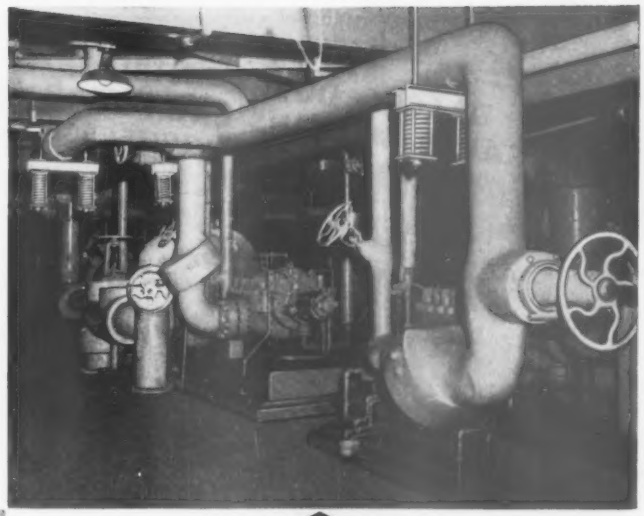

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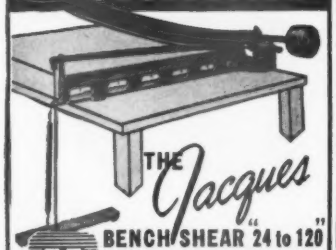

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EQUIPMENT NEWS

(Continued from page 234)

heavy loads quickly and safely.

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Screw Grab for Pulp

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Eliminating all obstruction along the top edge of the drawing area, drafting machine, Model D Wri graph, mounts in the extreme right-hand corner. This permits free movement of the scales over the entire drawing area (20x26 inches) without interference.

Machine is portable; protector can be locked at any angle. It may be fastened to any board or table.

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Suitable for marking parts in storage, wires, pipes, valves, and other items, 1-piece metal tag is made of zinc with an oxidation-resistant Cronak finish. It can be marked with a metal or glass marking pencil. Surface is covered with fine screen-line indentations which will retain markings.

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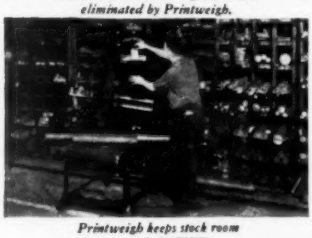

Printweigh keeps stock room records RIGHT!

Prints BIG figures—ACCURATE weights—with split-second speed!

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Eliminate human errors in reading, remembering and recording weight figures —stop losses that *directly affect your costs, profits and customer relations!*

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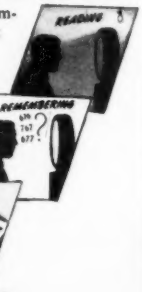
Beware of Human ERROR!

Errors in reading, remembering and recording are the birthplace of LOSS. Printweigh stops human error.



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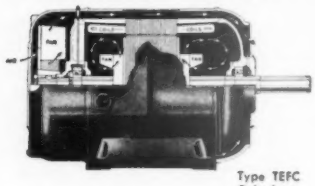

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Totally enclosed, constant speed, continuous duty—designed for cooler and more economical operation under extreme heat and dust. Fully ball bearing quiet running.

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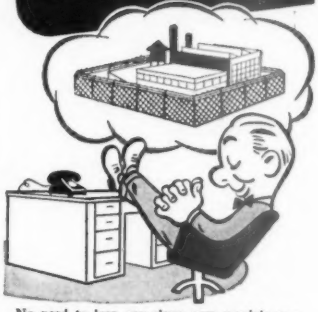

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Because they are *ready-made*, standardized and easily assembled, "HALLOWELL" Benches of Steel eliminate the trouble and expense of "building your own", providing a convenient and economical means of giving your workers the adequate and well-planned work space so necessary for maximum productivity.

"HALLOWELL" Benches are made in standardized, interchangeable units, a feature of particular value in plant layout and planning. Four standard style variations, three top materials, four stock length units, three widths and three standard heights offer the plant engineer a large number of possible combinations that can be adapted to almost any individual requirement. Furthermore, single "HALLOWELL" Benches can be bolted together to form a long, continuous bench, which at any time may be taken down and reassembled as individual units.

Simple and functional in design, Ready-Made "HALLOWELL" Benches of Steel present an attractive, clean-cut appearance that does credit to any plant, and which tends to improve worker performance and encourage better plant housekeeping. And because of their extra-rigid, heavy-duty construction, they need no costly bolting to the floor, and therefore the installation and maintenance costs are minimized and long, trouble-free service assured.

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McGraw-Hill Book Company, Inc. **Text-Film Department**

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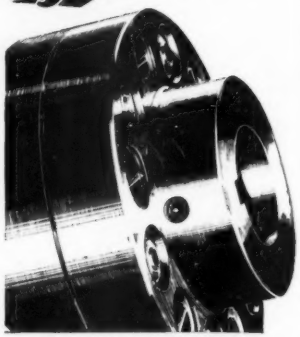

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309

A New Principle in Radius Gages

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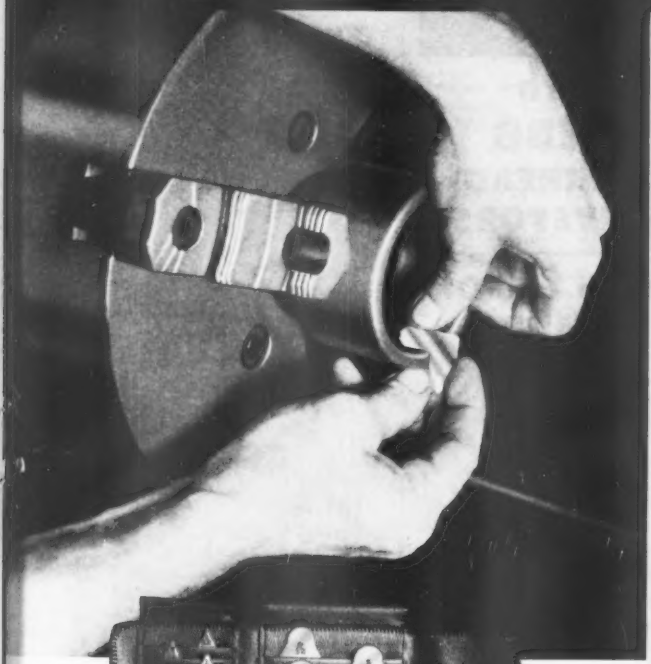
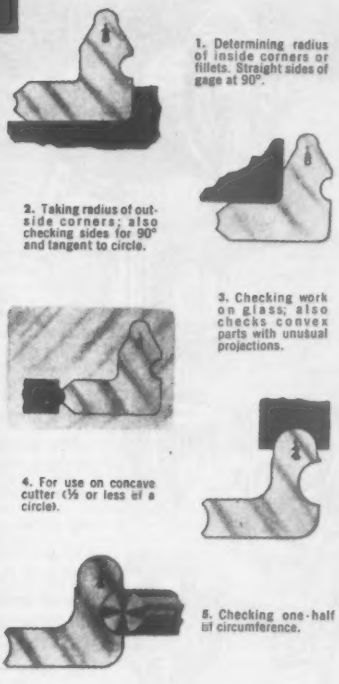
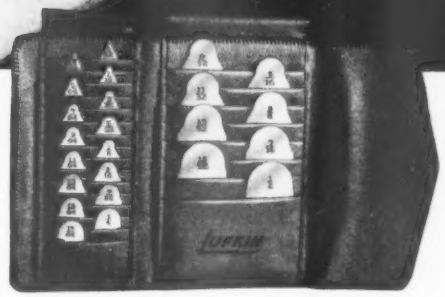



1. Determining radius of inside corners or fillets. Straight sides of gage at 90°.
2. Taking radius of outside corners; also checking sides for 90° and tangent to circle.
3. Checking work on glass; also checks convex parts with unusual projections.
4. For use on concave cutter (½ or less of a circle).
5. Checking one-half of circumference.



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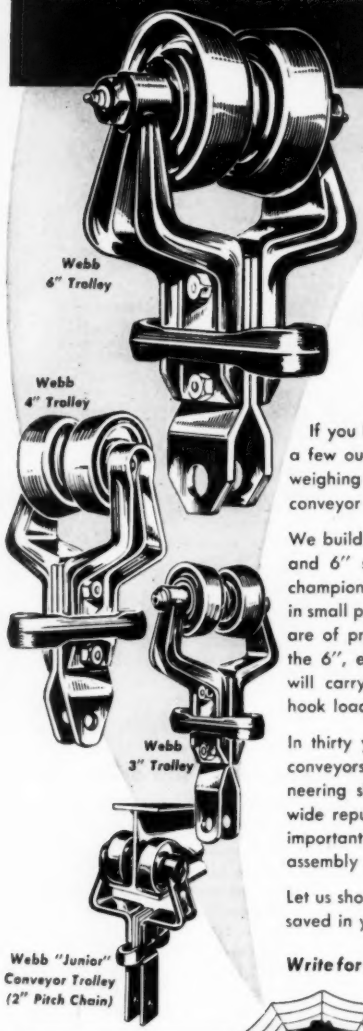

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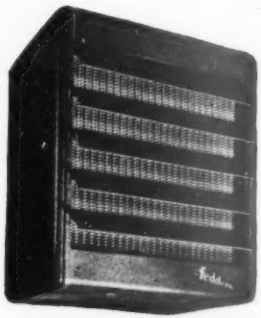

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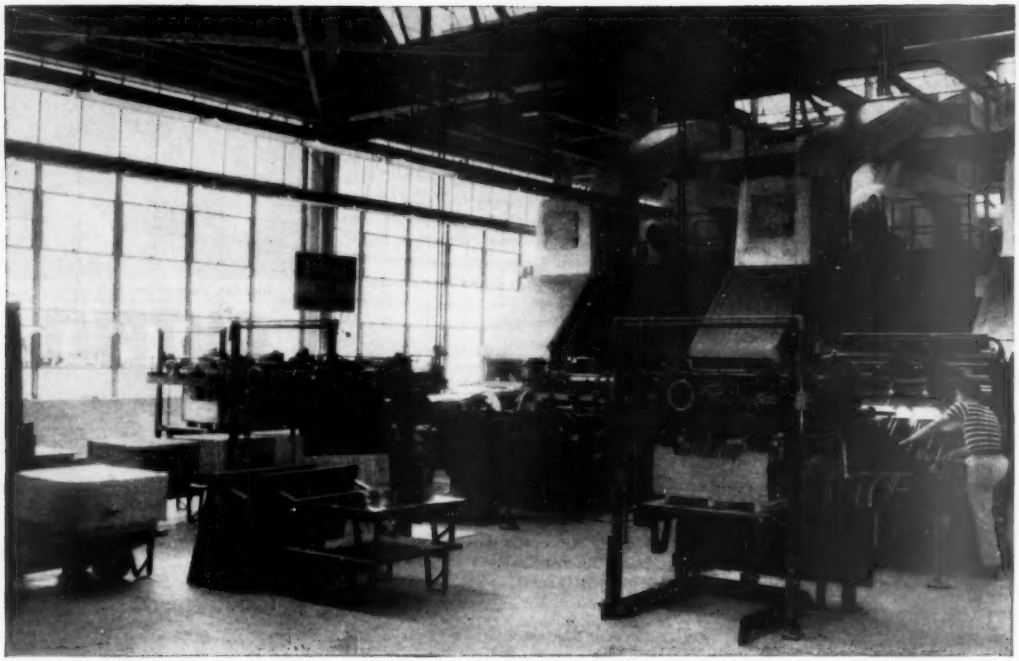

An abundance of diffused daylight streams into the plant of the American Can Company at Hillside, N. J., filtered through large windows and skylights of Blue Ridge Frosted *Aklo* Glass. Restful daylighting for the eyes—and a more comfortable place to work.

More comfortable to see . . . more comfortable to work

FILTERED DAYLIGHT

The kind of daylight you get in your plant depends on the kind of glass in your windows. You can provide abundant daylight, without annoying glare or excessive solar heat, with Blue Ridge Frosted *Aklo** Glass.

Reduces Glare—No need to paint glass or hang shades. Let the sunlight come in—softened and diffused by blue-green Frosted *Aklo* Glass. More eye comfort—better seeing—better workmanship and happier employes.

Retards Sun Heat—*Aklo* Glass excludes solar heat. Interiors are cooler—workers more comfortable. Load on air conditioning is effectively reduced. Temperature and humidity can be more accurately controlled.

Aklo is made by the Blue Ridge Glass Corporation of Kingsport, Tennessee, and sold by Libbey-Owens-Ford glass distributors. To see for yourself how Frosted *Aklo* Glass reduces glare and sun heat, ask your distributor for a Radiometer demonstration.

*®

Free Book on Reduction of Sun Glare and Heat

Write to Blue Ridge Sales Division, Libbey-Owens-Ford Glass Co., 90109 Nicholas Building, Toledo 3, Ohio.

BLUE RIDGE AKLO GLASS

Heat Absorbing • Glare Reducing • Figured and Wire Glass

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SAFETY SWITCHES

*Types A, C and D

Backed by 40 years' DESIGN LEADERSHIP

The remarkable superiority of this new switch line is reflected in these TYPE A design and operating features:

MODERN STYLING is both functional and attractive.

COMPACTNESS obtained without sacrifice of wiring convenience.

FULL COVER INTERLOCK has attachment that locks switch "ON" or "OFF" with 1, 2, 3 or 4 padlocks of nearly any size or shape.

SIMPLE MECHANISM—quick make-and-break action—no dead center.

SILVER-PLATED current-carrying parts.

EXPOSED BLADES permit visual checks of switch operation.

DEAD-FRONT line terminals are protected by hinged arc chamber cover.

MAGNETIC ARC PLATE adds to unusually high rupturing capacity.

POSITIVE PRESSURE jaws and fuse clips, steel reinforced, silver-plated.

NON-TRACKING insulation used in base. Melamine insulating cross-bar.

REMOVABLE PRESSURE CONNECTORS permit substitution of solder lugs, where preferred.

*Types **C** and **D** similar to Type **A** in appearance—differ in construction details*

In production: 30 and 60 ampere sizes ...NOW; 100 and 200 ampere sizes ...SOON; Larger ampere sizes ...LATER

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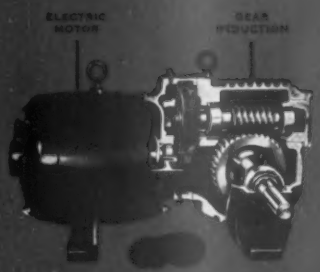

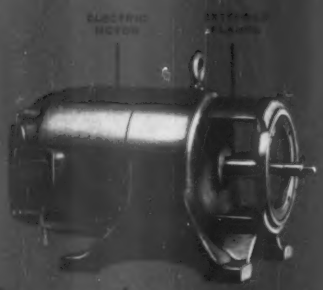

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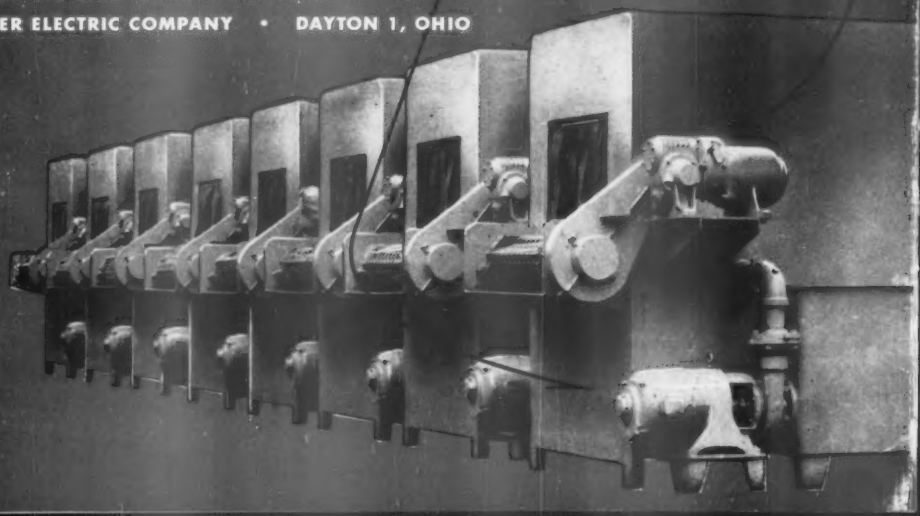
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